This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

A propos de ce livre

Ceci est une copie numérique d'un ouvrage conservé depuis des générations dans les rayonnages d'une bibliothèque avant d'être numérisé avec précaution par Google dans le cadre d'un projet visant à permettre aux internautes de découvrir l'ensemble du patrimoine littéraire mondial en ligne.

Ce livre étant relativement ancien, il n'est plus protégé par la loi sur les droits d'auteur et appartient à présent au domaine public. L'expression "appartenir au domaine public" signifie que le livre en question n'a jamais été soumis aux droits d'auteur ou que ses droits légaux sont arrivés à expiration. Les conditions requises pour qu'un livre tombe dans le domaine public peuvent varier d'un pays à l'autre. Les livres libres de droit sont autant de liens avec le passé. Ils sont les témoins de la richesse de notre histoire, de notre patrimoine culturel et de la connaissance humaine et sont trop souvent difficilement accessibles au public.

Les notes de bas de page et autres annotations en marge du texte présentes dans le volume original sont reprises dans ce fichier, comme un souvenir du long chemin parcouru par l'ouvrage depuis la maison d'édition en passant par la bibliothèque pour finalement se retrouver entre vos mains.

Consignes d'utilisation

Google est fier de travailler en partenariat avec des bibliothèques à la numérisation des ouvrages appartenant au domaine public et de les rendre ainsi accessibles à tous. Ces livres sont en effet la propriété de tous et de toutes et nous sommes tout simplement les gardiens de ce patrimoine. Il s'agit toutefois d'un projet coûteux. Par conséquent et en vue de poursuivre la diffusion de ces ressources inépuisables, nous avons pris les dispositions nécessaires afin de prévenir les éventuels abus auxquels pourraient se livrer des sites marchands tiers, notamment en instaurant des contraintes techniques relatives aux requêtes automatisées.

Nous vous demandons également de:

+ *Ne pas utiliser les fichiers à des fins commerciales* Nous avons conçu le programme Google Recherche de Livres à l'usage des particuliers. Nous vous demandons donc d'utiliser uniquement ces fichiers à des fins personnelles. Ils ne sauraient en effet être employés dans un quelconque but commercial.

+ *Ne pas procéder à des requêtes automatisées* N'envoyez aucune requête automatisée quelle qu'elle soit au système Google. Si vous effectuez des recherches concernant les logiciels de traduction, la reconnaissance optique de caractères ou tout autre domaine nécessitant de disposer d'importantes quantités de texte, n'hésitez pas à nous contacter. Nous encourageons pour la réalisation de ce type de travaux l'utilisation des ouvrages et documents appartenant au domaine public et serions heureux de vous être utile.

+ *Ne pas supprimer l'attribution* Le filigrane Google contenu dans chaque fichier est indispensable pour informer les internautes de notre projet et leur permettre d'accéder à davantage de documents par l'intermédiaire du Programme Google Recherche de Livres. Ne le supprimez en aucun cas.

+ *Rester dans la légalité* Quelle que soit l'utilisation que vous comptez faire des fichiers, n'oubliez pas qu'il est de votre responsabilité de veiller à respecter la loi. Si un ouvrage appartient au domaine public américain, n'en déduisez pas pour autant qu'il en va de même dans les autres pays. La durée légale des droits d'auteur d'un livre varie d'un pays à l'autre. Nous ne sommes donc pas en mesure de répertorier les ouvrages dont l'utilisation est autorisée et ceux dont elle ne l'est pas. Ne croyez pas que le simple fait d'afficher un livre sur Google Recherche de Livres signifie que celui-ci peut être utilisé de quelque façon que ce soit dans le monde entier. La condamnation à laquelle vous vous exposeriez en cas de violation des droits d'auteur peut être sévère.

À propos du service Google Recherche de Livres

En favorisant la recherche et l'accès à un nombre croissant de livres disponibles dans de nombreuses langues, dont le français, Google souhaite contribuer à promouvoir la diversité culturelle grâce à Google Recherche de Livres. En effet, le Programme Google Recherche de Livres permet aux internautes de découvrir le patrimoine littéraire mondial, tout en aidant les auteurs et les éditeurs à élargir leur public. Vous pouvez effectuer des recherches en ligne dans le texte intégral de cet ouvrage à l'adresse `http://books.google.com`

B 431268

Digitized by Google

GENERAL LIBRARY.

Digitized by Google

Digitized by Google

Digitized by Google

TS
460
.C67

Digitized by Google

Digitized by Google

PROCÉDÉS

DE

FORGEAGE DANS L'INDUSTRIE

ATLAS

Digitized by Google

PARIS. — IMPRIMERIE E. BERNARD ET Cie

23, RUE DES GRANDS-AUGUSTINS, 23

Digitized by Google

Ouvrage couronné par la Société des Anciens Élèves
des Écoles nationales d'Arts et Métiers, dans sa séance du 17 février 1895
présidée par M. Félix Faure, Président de la République
et extrait du *Bulletin technologique (1896)*

PROCÉDÉS
DE
FORGEAGE
DANS L'INDUSTRIE

PAR

C. CODRON
INGÉNIEUR CIVIL
Professeur du cours des Arts mécaniques à l'Institut Industriel du Nord
Officier d'académie

ATLAS

PARIS
E. BERNARD et Cie, IMPRIMEURS-EDITEURS
53ter, Quai des Grands-Augustins, 53ter
1897

Digitized by Google

Digitized by Google

230197

Digitized by Google

Fig. 1.

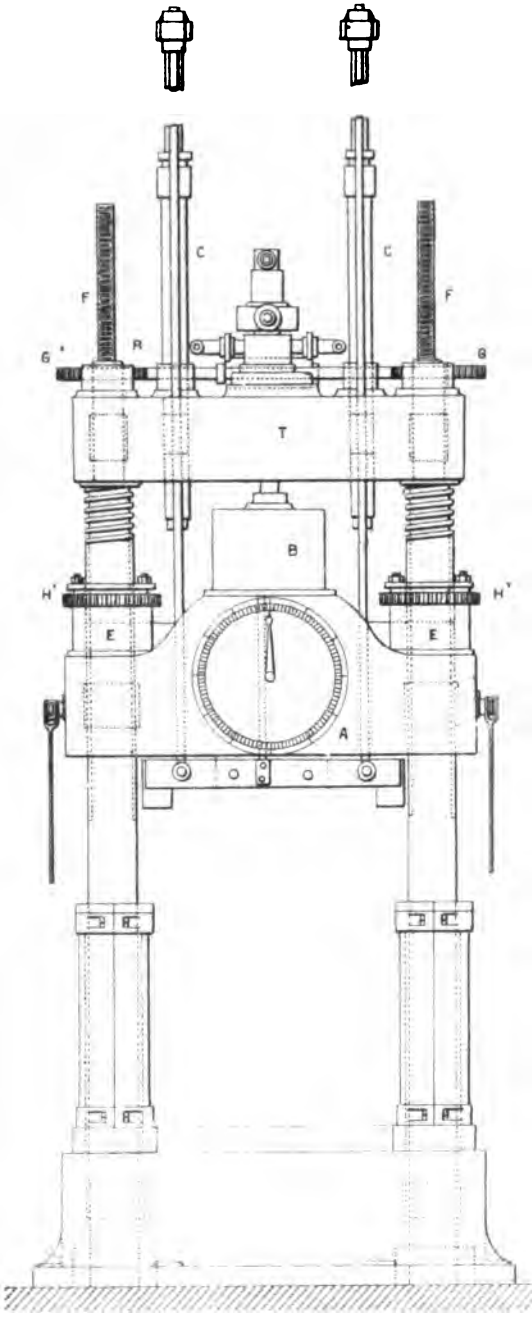
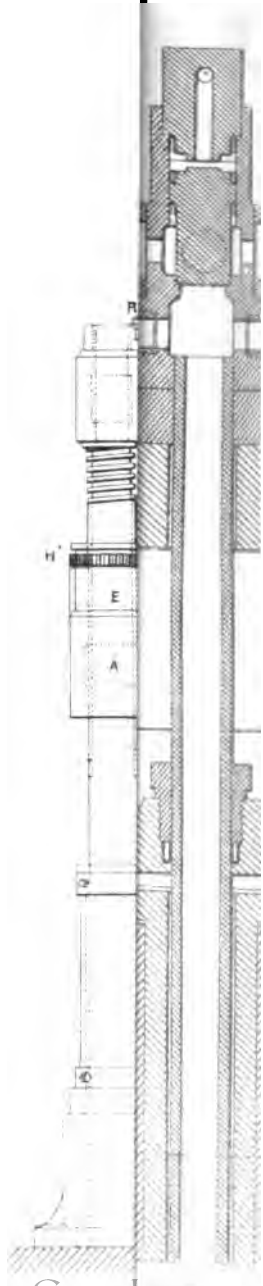


Fig. 5.



Digitized by Google

Whitworth)

875

Fig. 7'

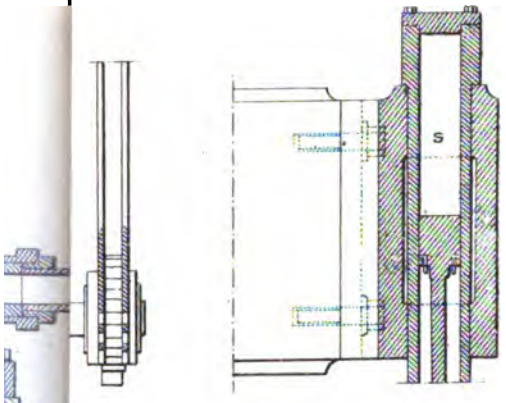


Fig. 11.

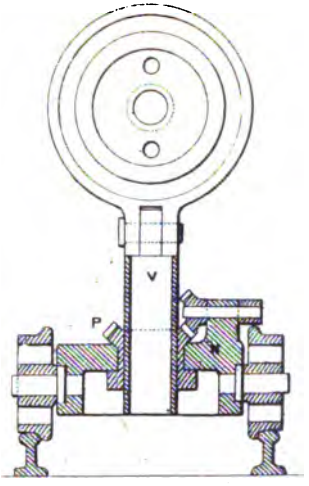
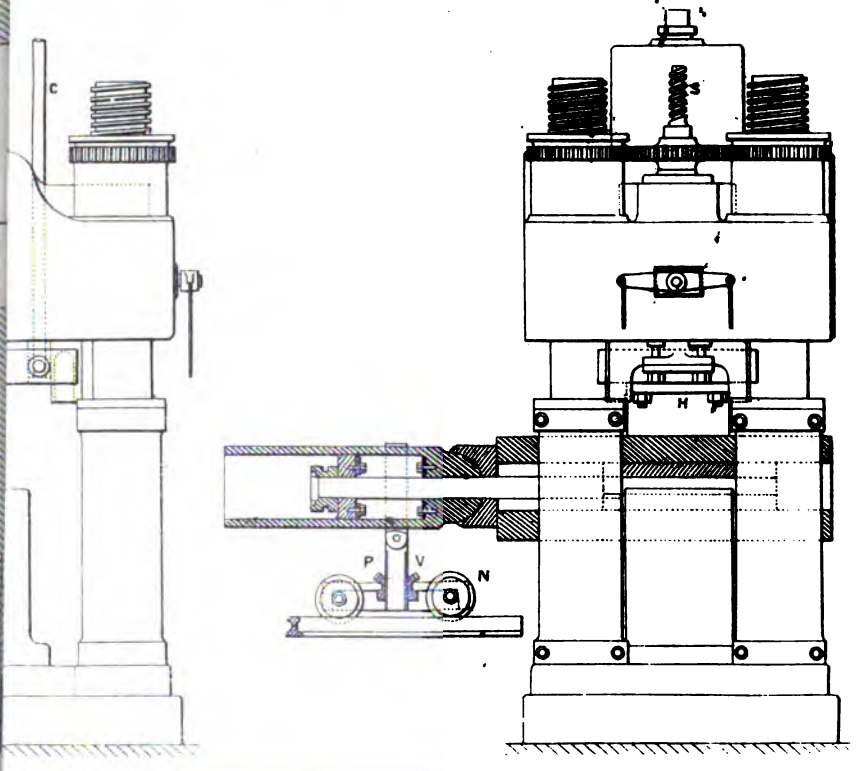


Fig. 10.



IMP. CHAIX-PARIS - 24332. 12-95

Digitized by Google

Digitized by Google

Digitized by Google

Fig. 3. Coupe CD

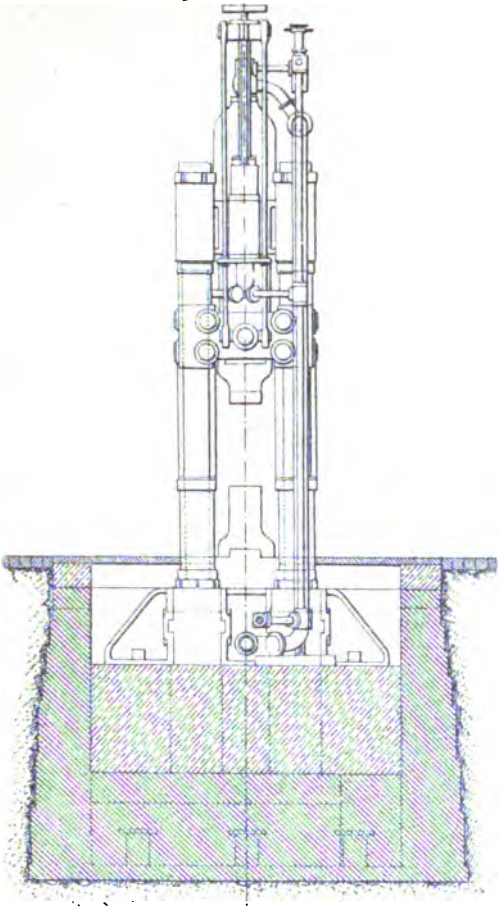


Fig. 1.

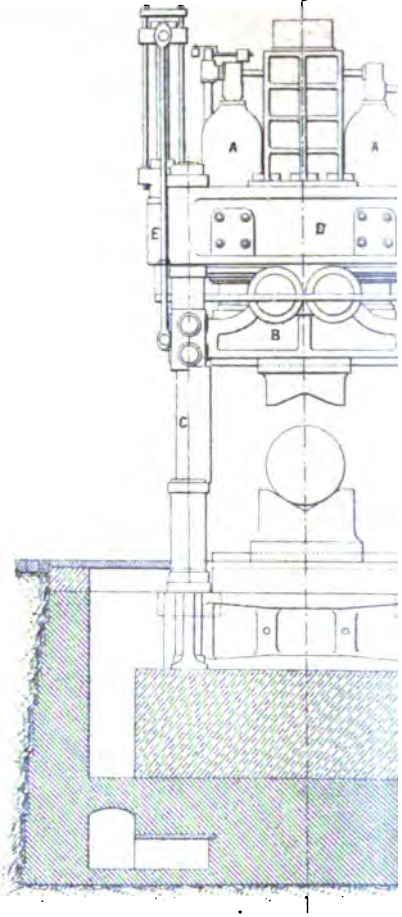
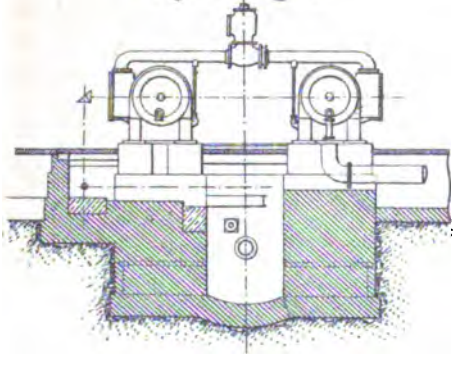
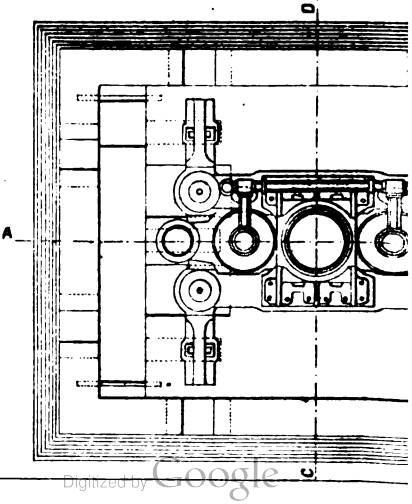


Fig. 6. Coupe EF





Digitized by Google

Fig. 4. Coupe IJ

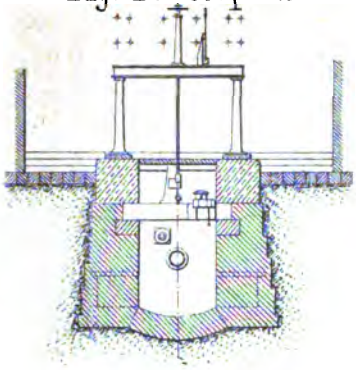
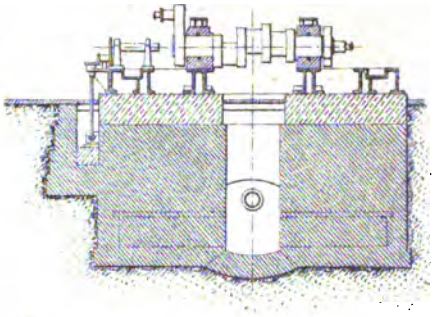
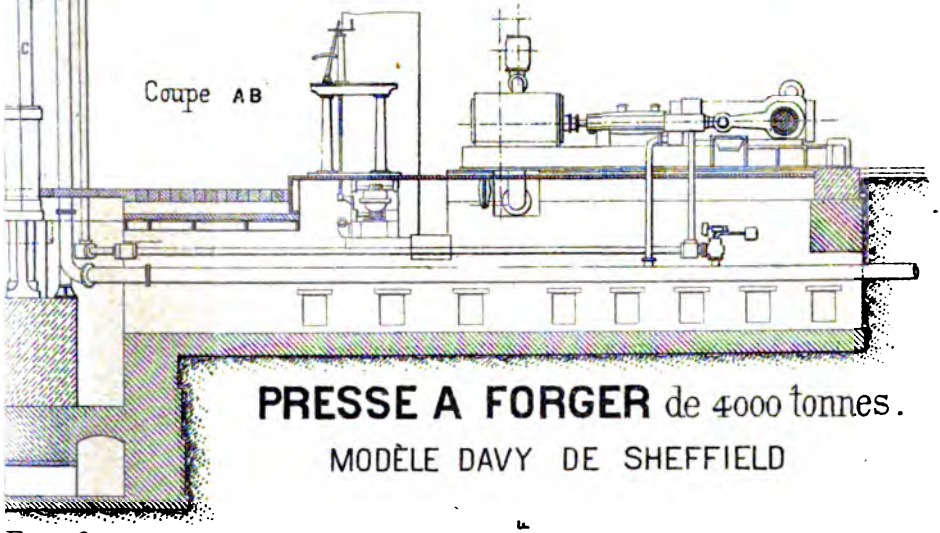


Fig. 5. Coupe GH



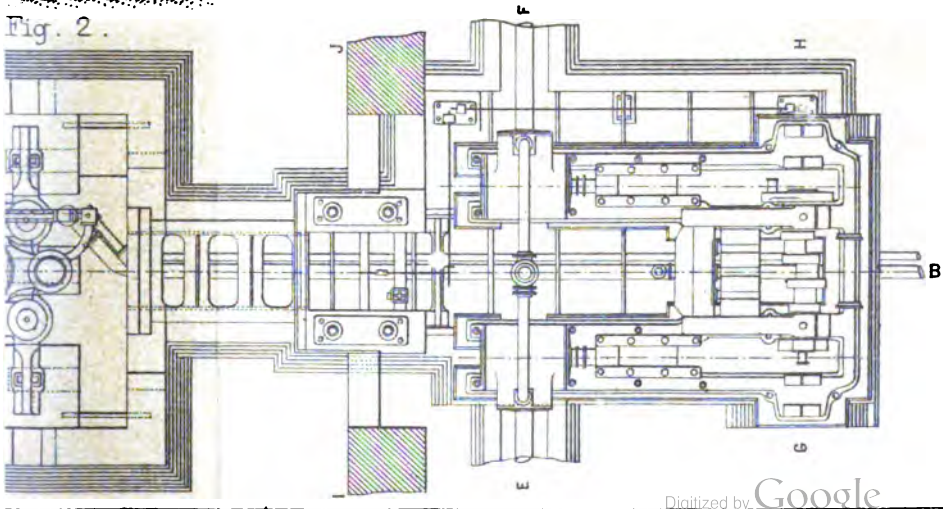
Coupe AB



PRESSE A FORGER de 4000 tonnes.

MODÈLE DAVY DE SHEFFIELD

Fig. 2.



Digitized by Google

IMP. CHAIX - PARIS - 24320-12-95

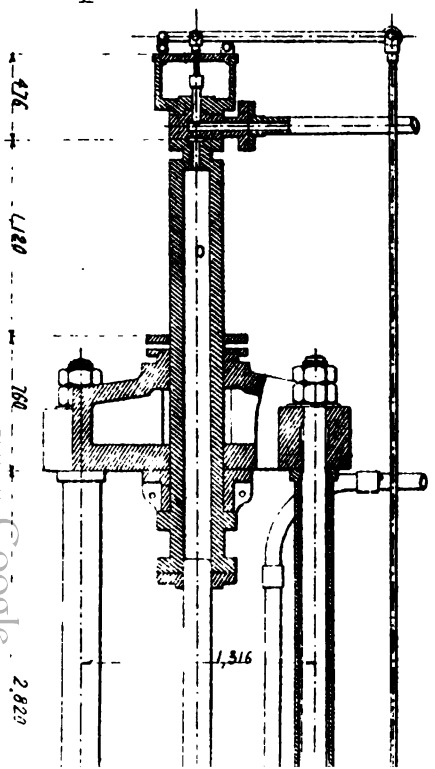
Digitized by Google

Digitized by Google

PRESSE HYDRAULIQUE A FORGER de 12 tonnes

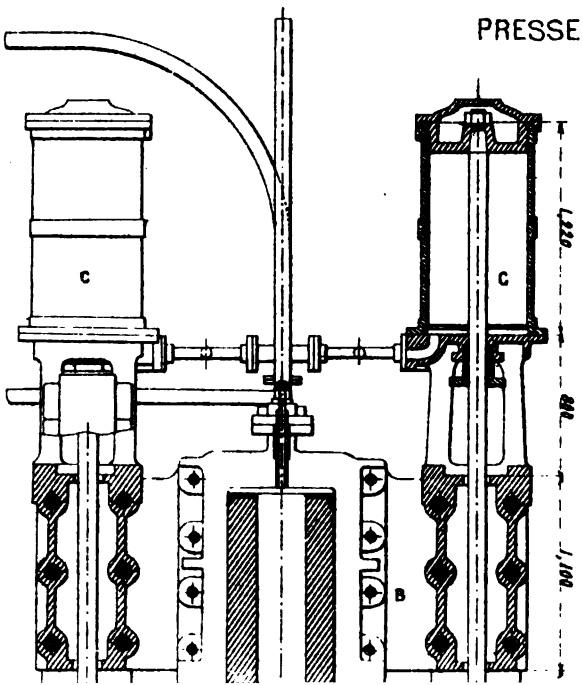
SYSTÈME L.W. BREUER SCHUHMACHER et Cie (B.S.G.D.G.)

Compresseur – Elévation.

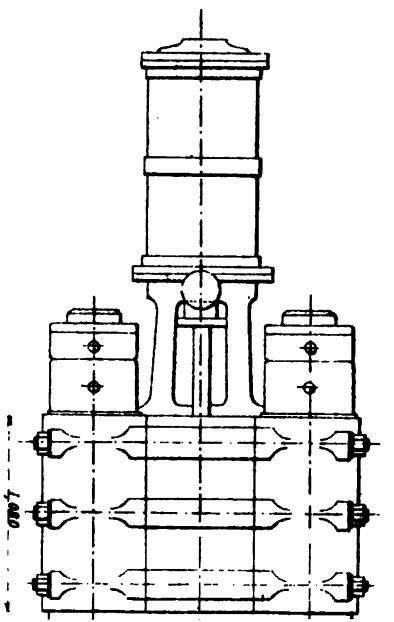


Elévation.

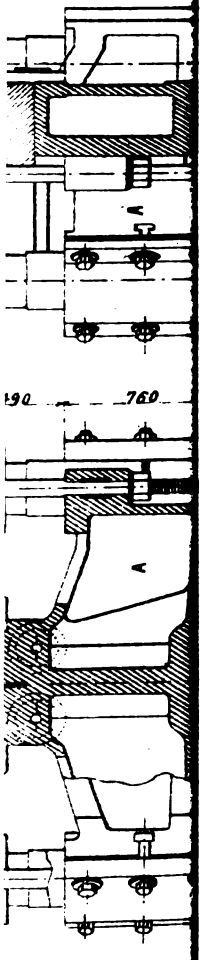
PRESSE

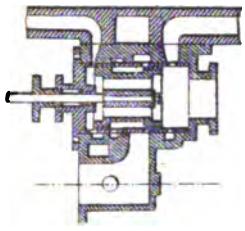


Vue latérale.

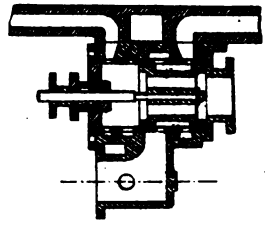


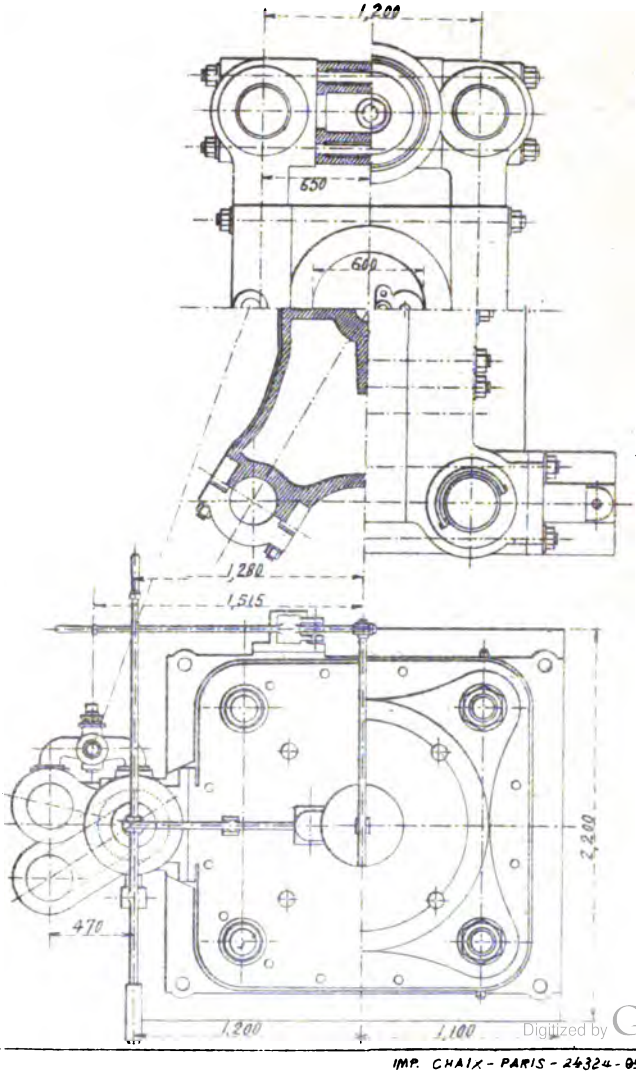
Digitized by Google





Position inférieure du tiroir





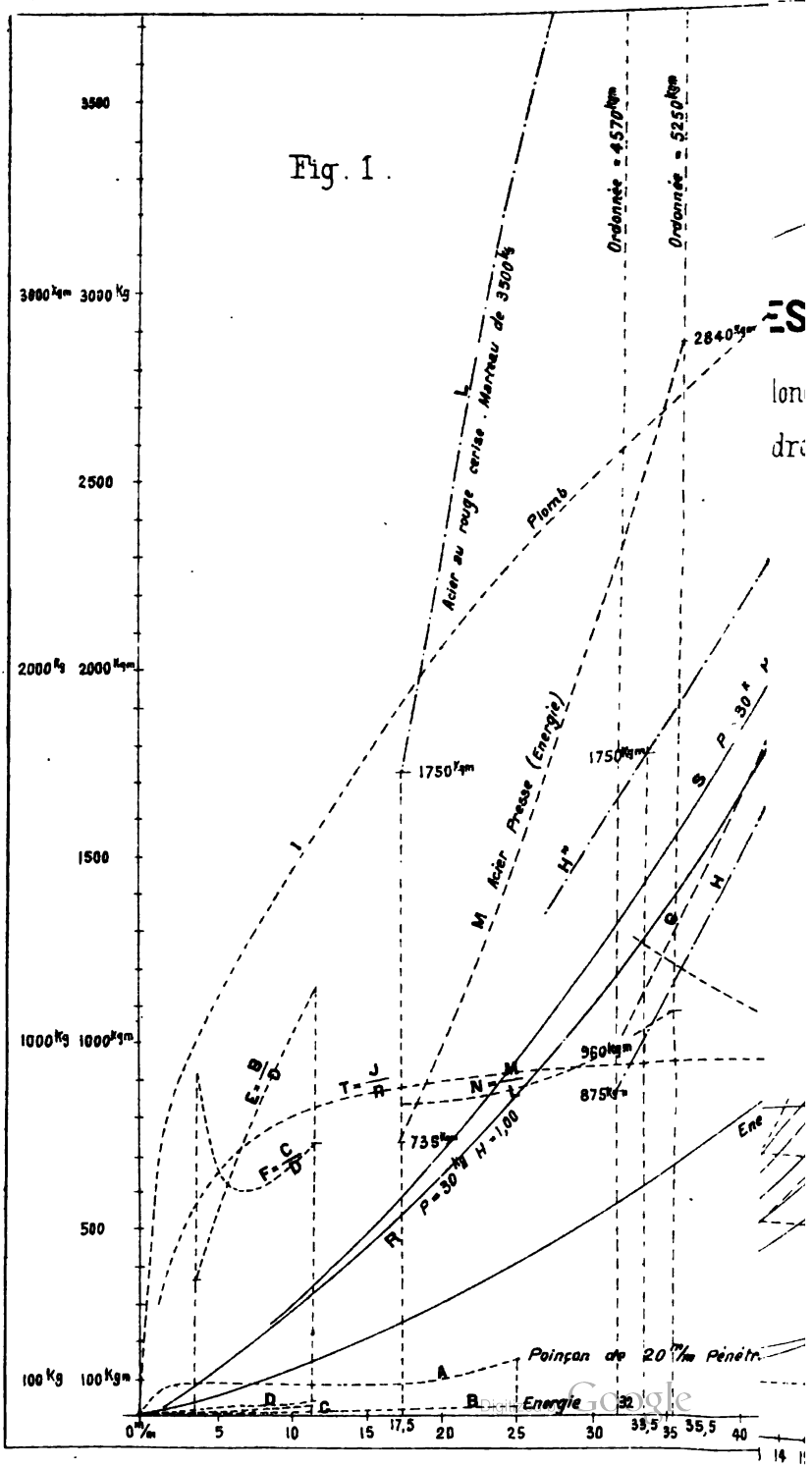
Digitized by Google

IMP. CHAIX - PARIS - 24324-05

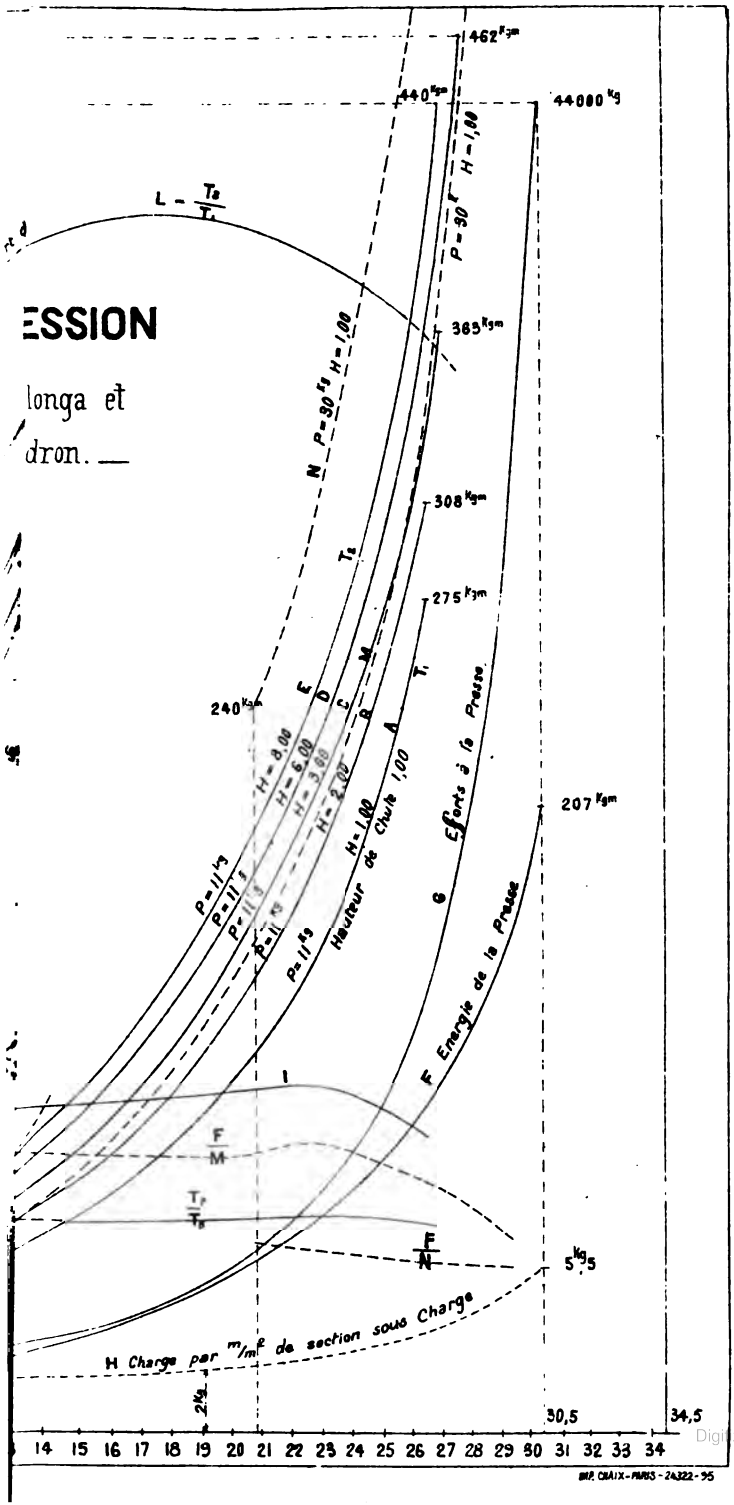
Digitized by Google

Digitized by Google

Fig. 1.



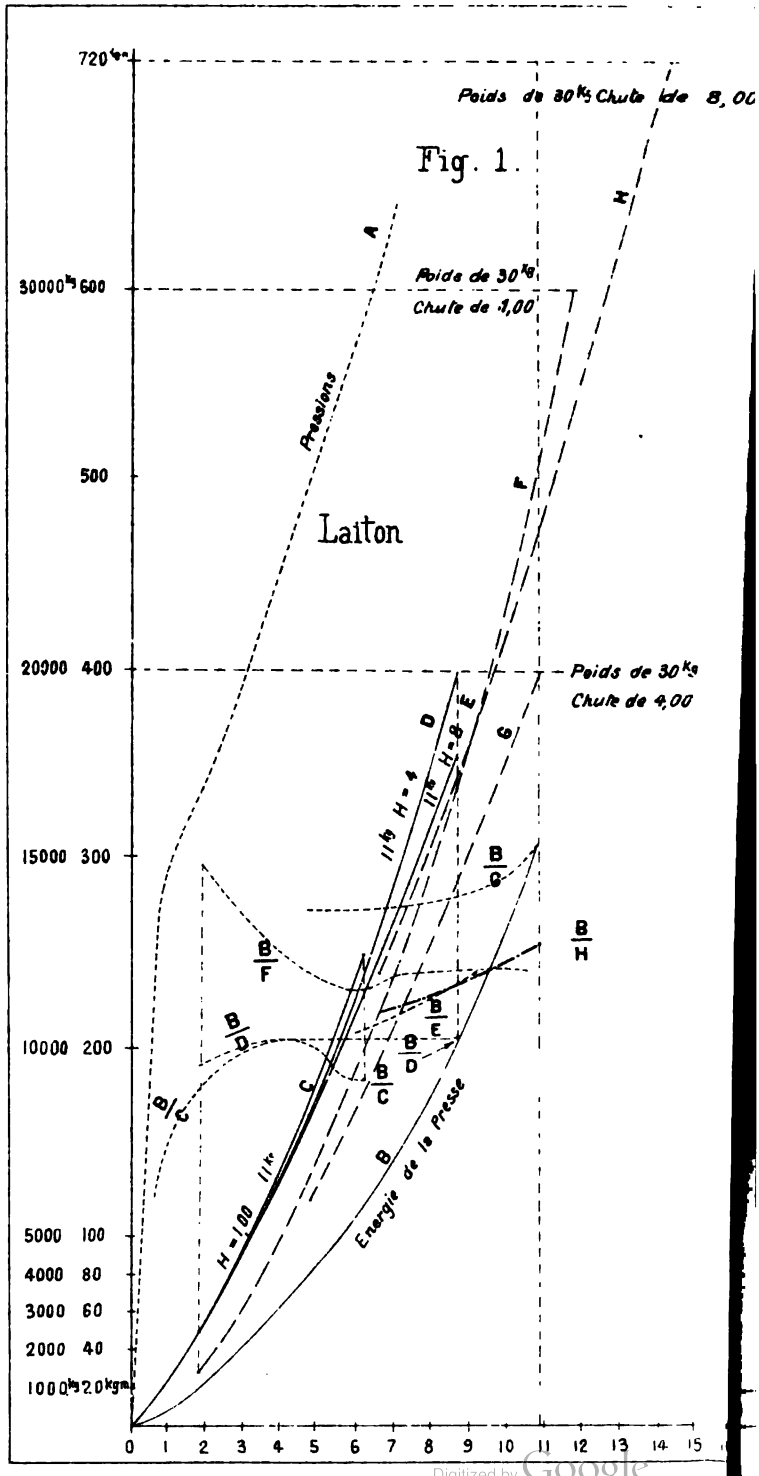
3500
3000 Kgm 3000 Kg
2500
2000 Kg 2000 Kgm
1500
1000 Kg 1000 Kgm
500
100 Kg 100 Kgm
0 m/m
5
10
15
17,5
20
25
30
33,5
35
35,5
40
Ordonnée = 4570 Kgm
Ordonnée = 5250 Kgm
Acier au rouge cerise. Marteau de 3500 Kg
Plomb
Acier Presse (Energie)
2840 Kgm
1750 Kgm
1750 Kgm
960 Kgm
875 Kgm
735 Kgm
P = 30 Kg H = 1,00
T = J/R
N = M/L
E = B/D
F = C/D
Poinçon de 20 m/m Pénétr.
Energie



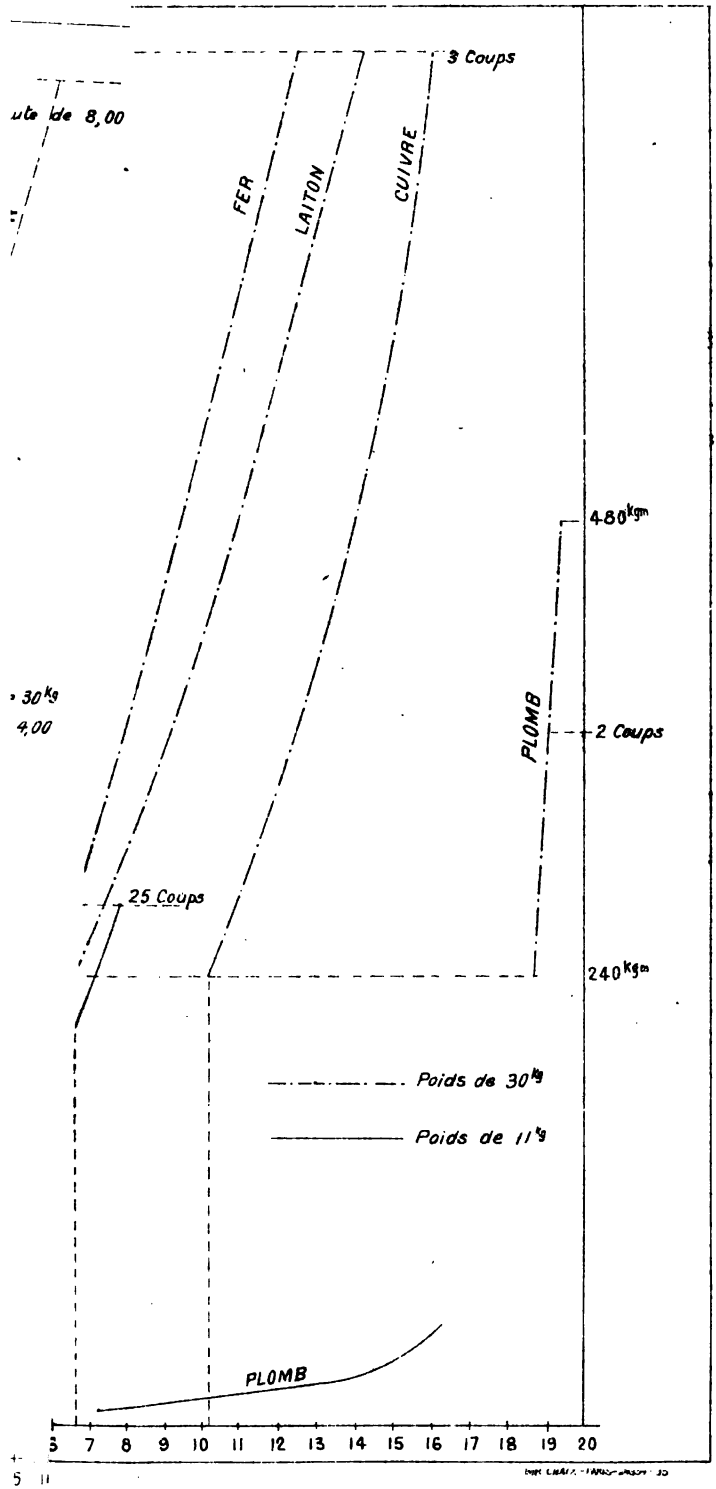
Digitized by Google

Digitized by Google

Digitized by Google



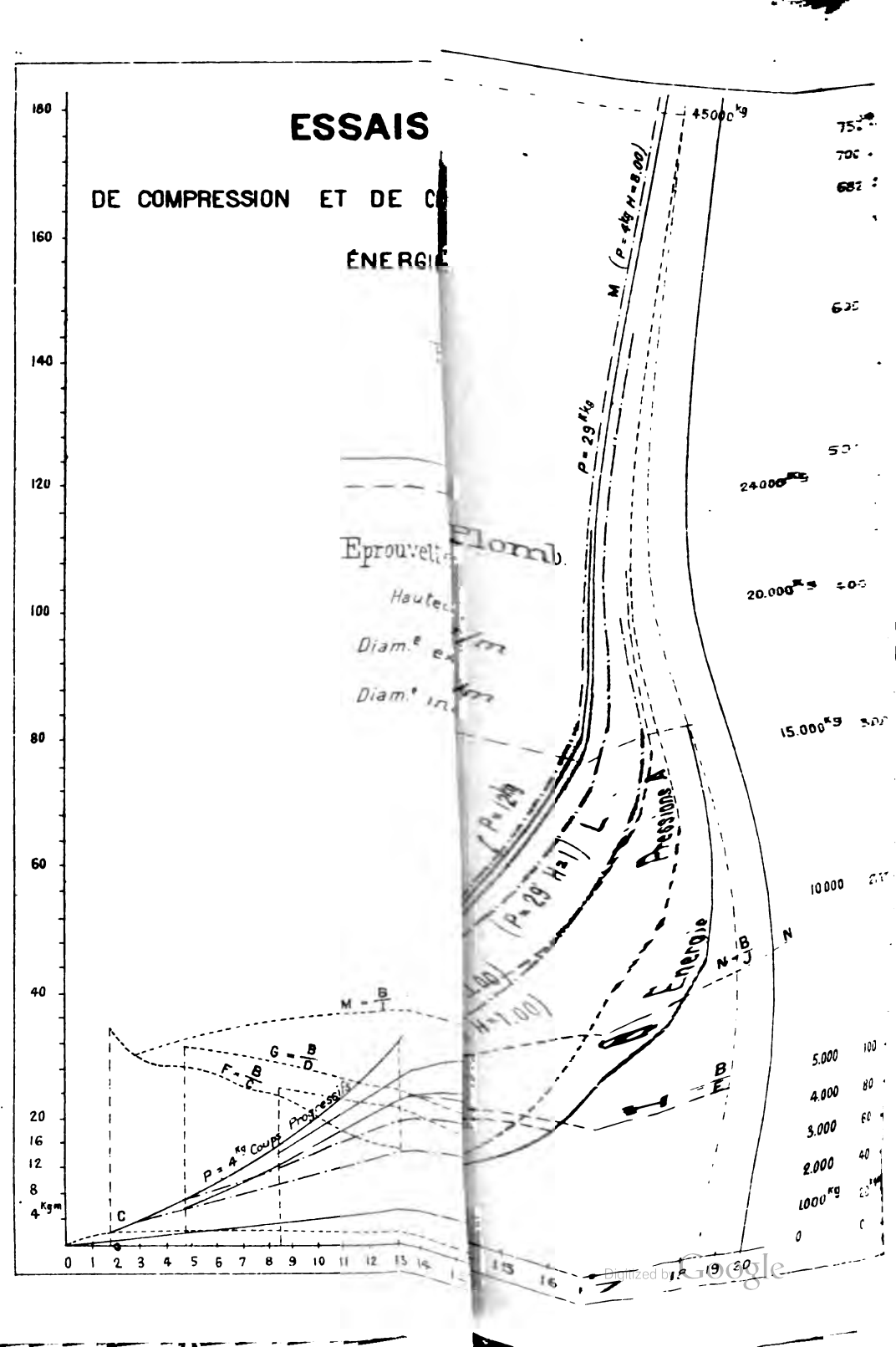
Digitized by Google



Digitized by Google

Digitized by Google

Digitized by Google


ESSAIS
DE COMPRESSION ET DE C
ÉNERGIE
Eprouvette Plomb
Hauteur
Diam.e ext.m
Diam.e int.m
45000 kg
24000 kg
20.000 kg
15.000 kg
10.000
5.000
4.000
3.000
2.000
1000 kg
M (P=4kg H=8,00)
P=29 Kg
(P=29 H=1,00)
Pressions
Energie
N
M = B/I
G = B/D
F = C/B
P = 4 kg Coups Progressifs
C
180
160
140
120
100
80
60
40
20
16
12
8
4 Kgm
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Formations des Eprouvettes tubulaires

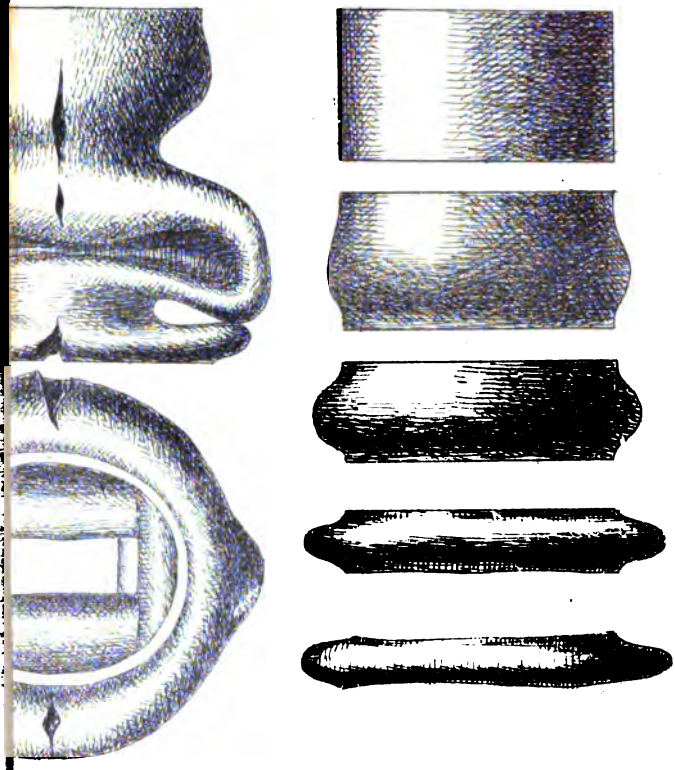
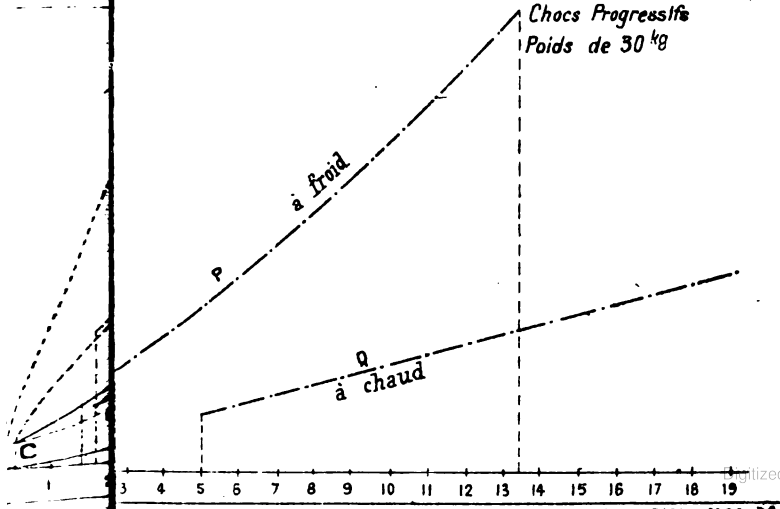


Fig. 4. Tubes de 80m/m de Hauteur.

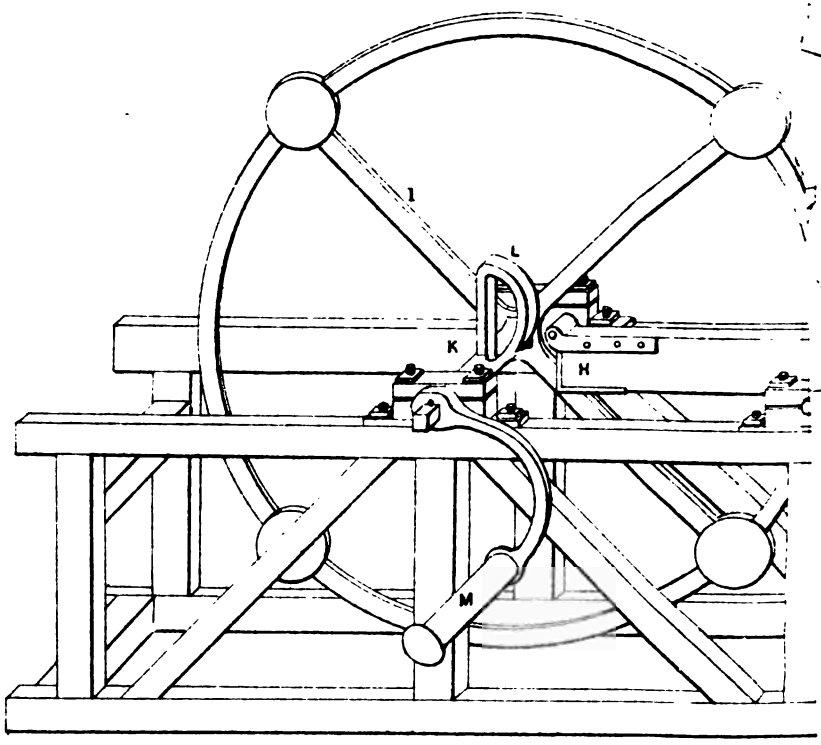


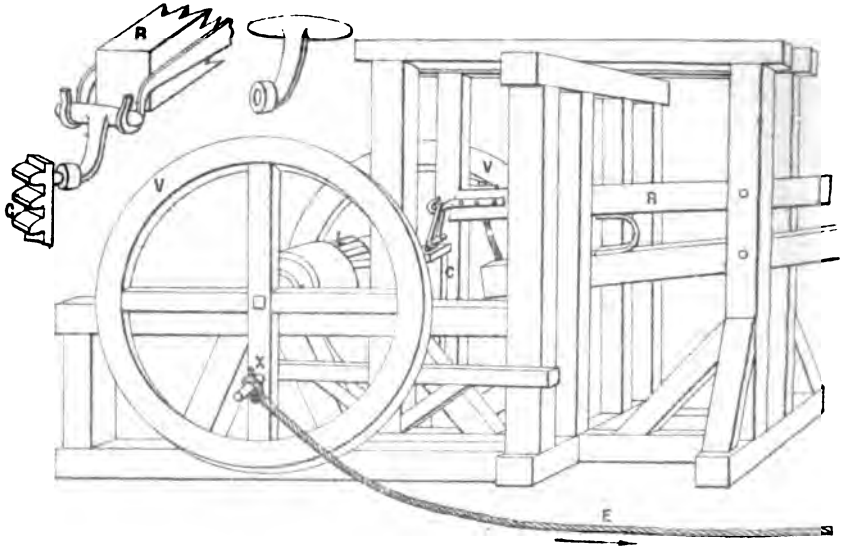
IMP. CHAIX-PARIS-6522-96

Digitized by Google

Digitized by Google

Digitized by Google





Digitized by Google

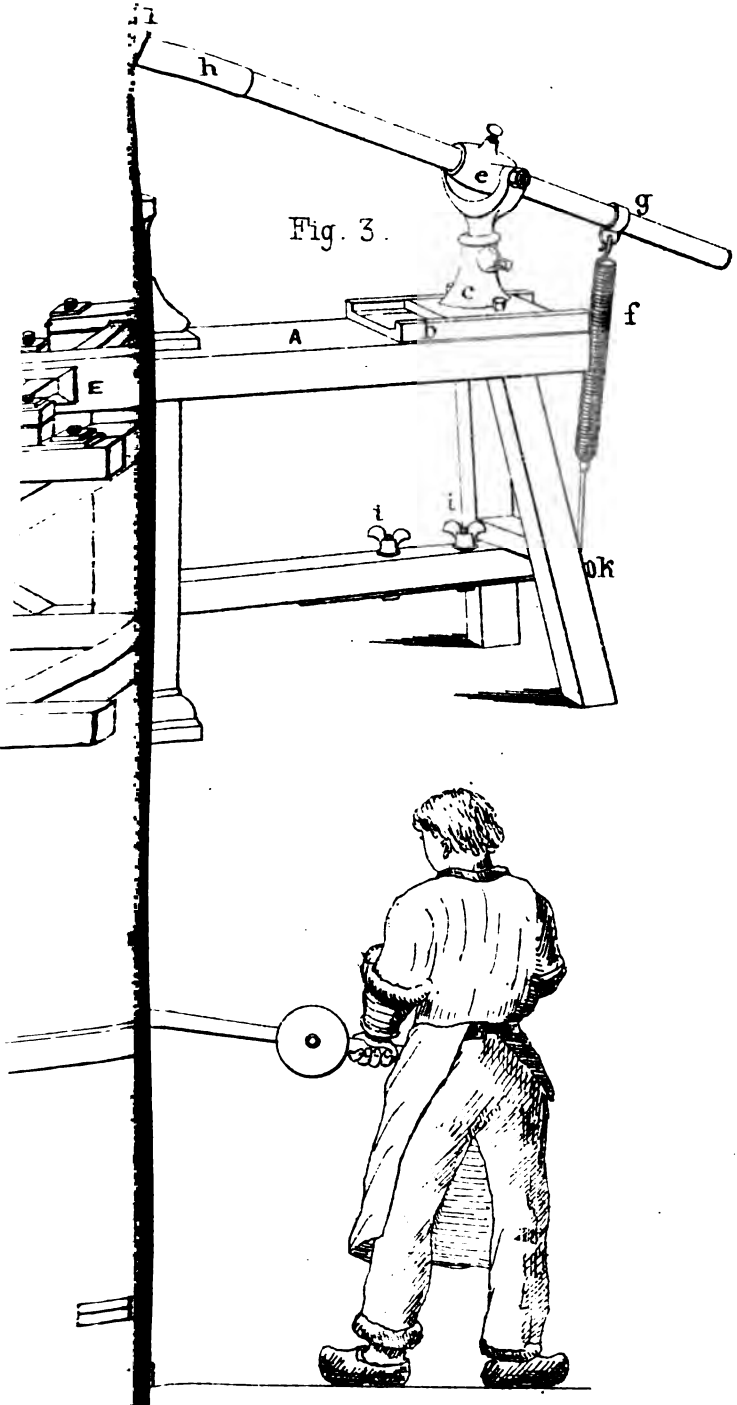


Fig. 3.

IMP. CHAIX - PARIS - 28498-95

Digitized by Google

Digitized by Google

Digitized by Google

Fig. 1.

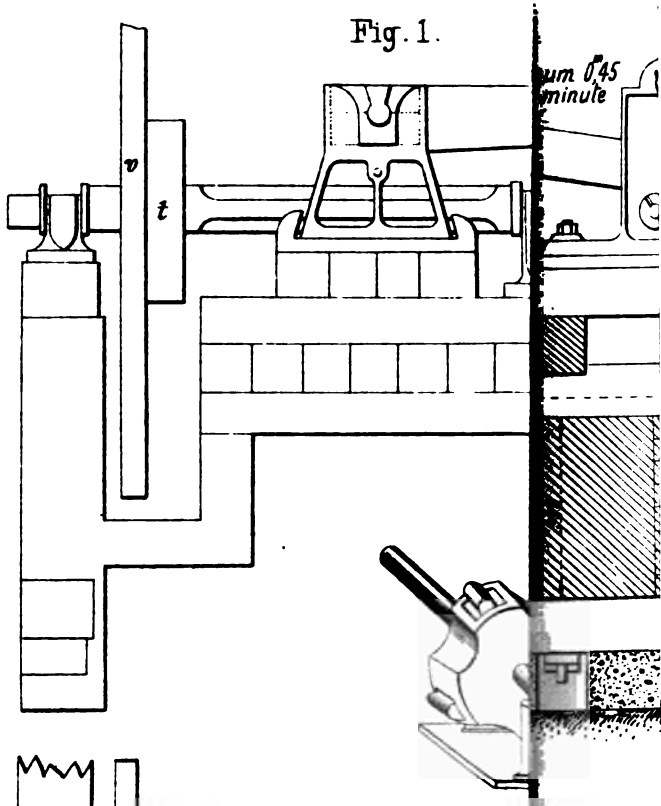
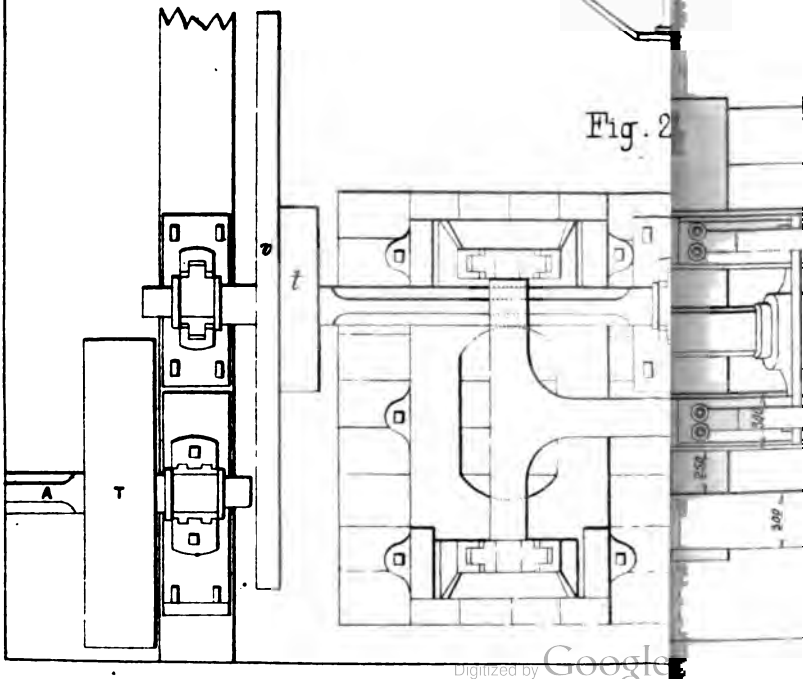


Fig. 2.



Digitized by Google

ig. 3. *Ateliers de Graffenstaden (1861)*

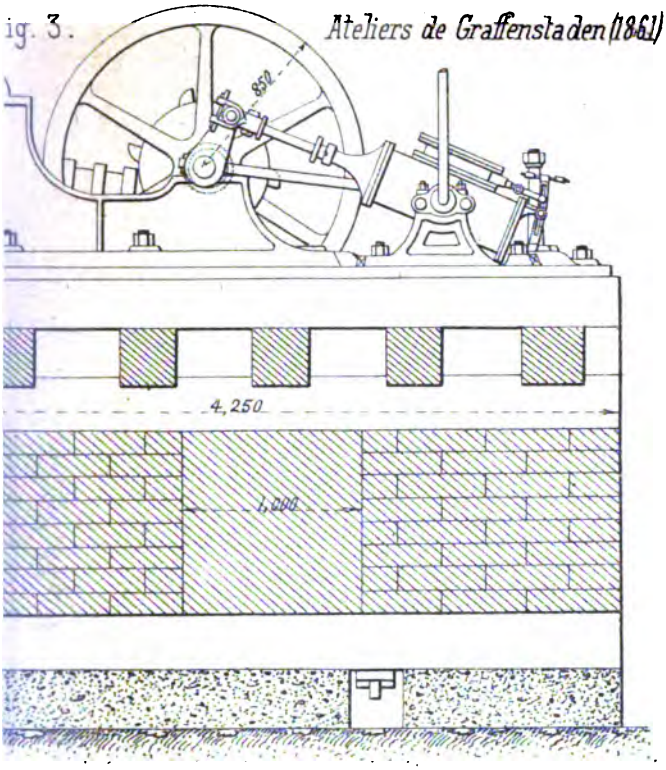
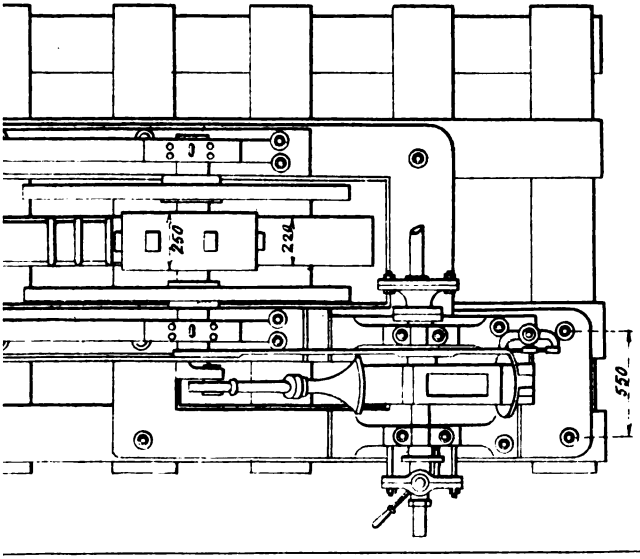


Fig. 4.

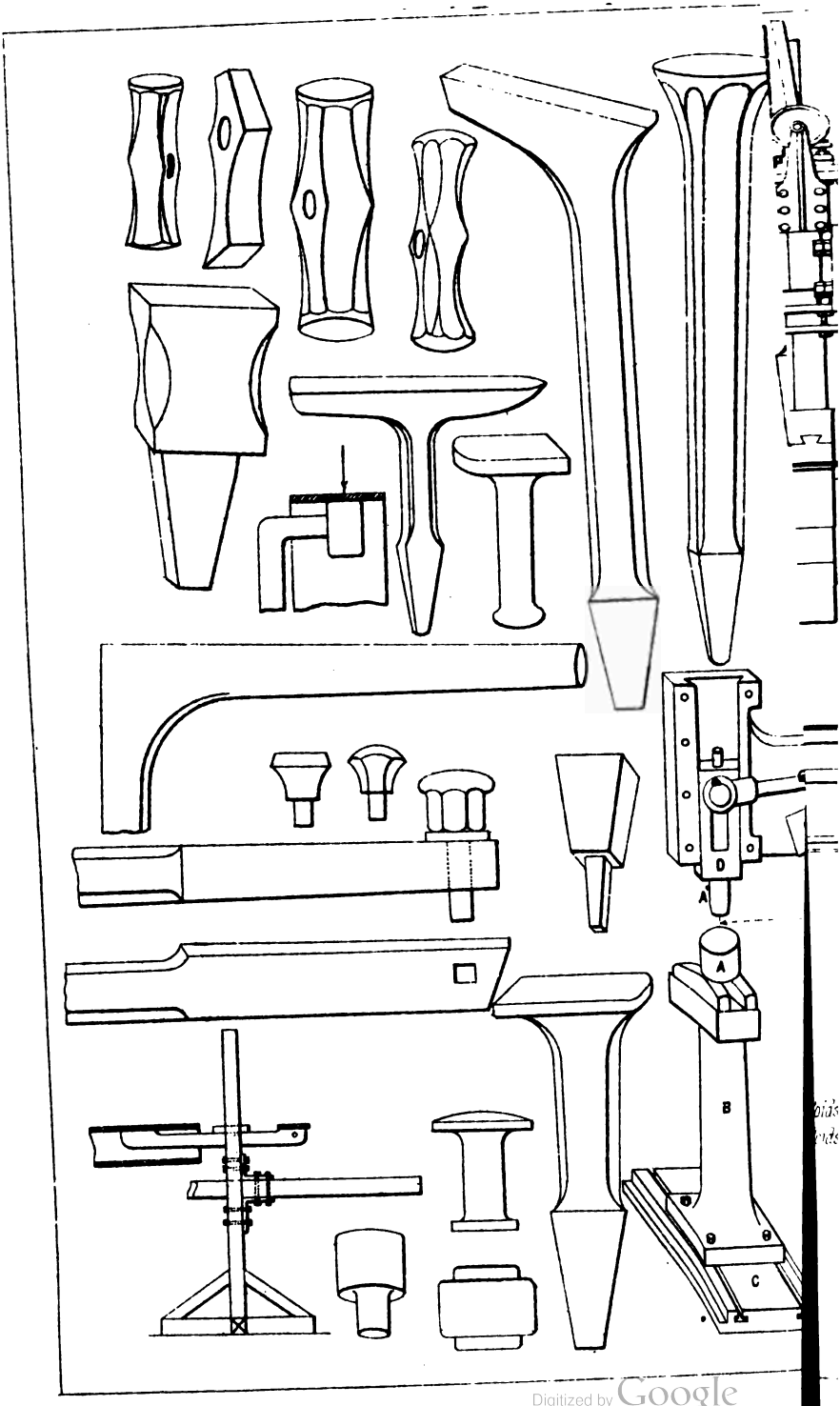


IMP. CHAIX – PARIS - 26326 · 95

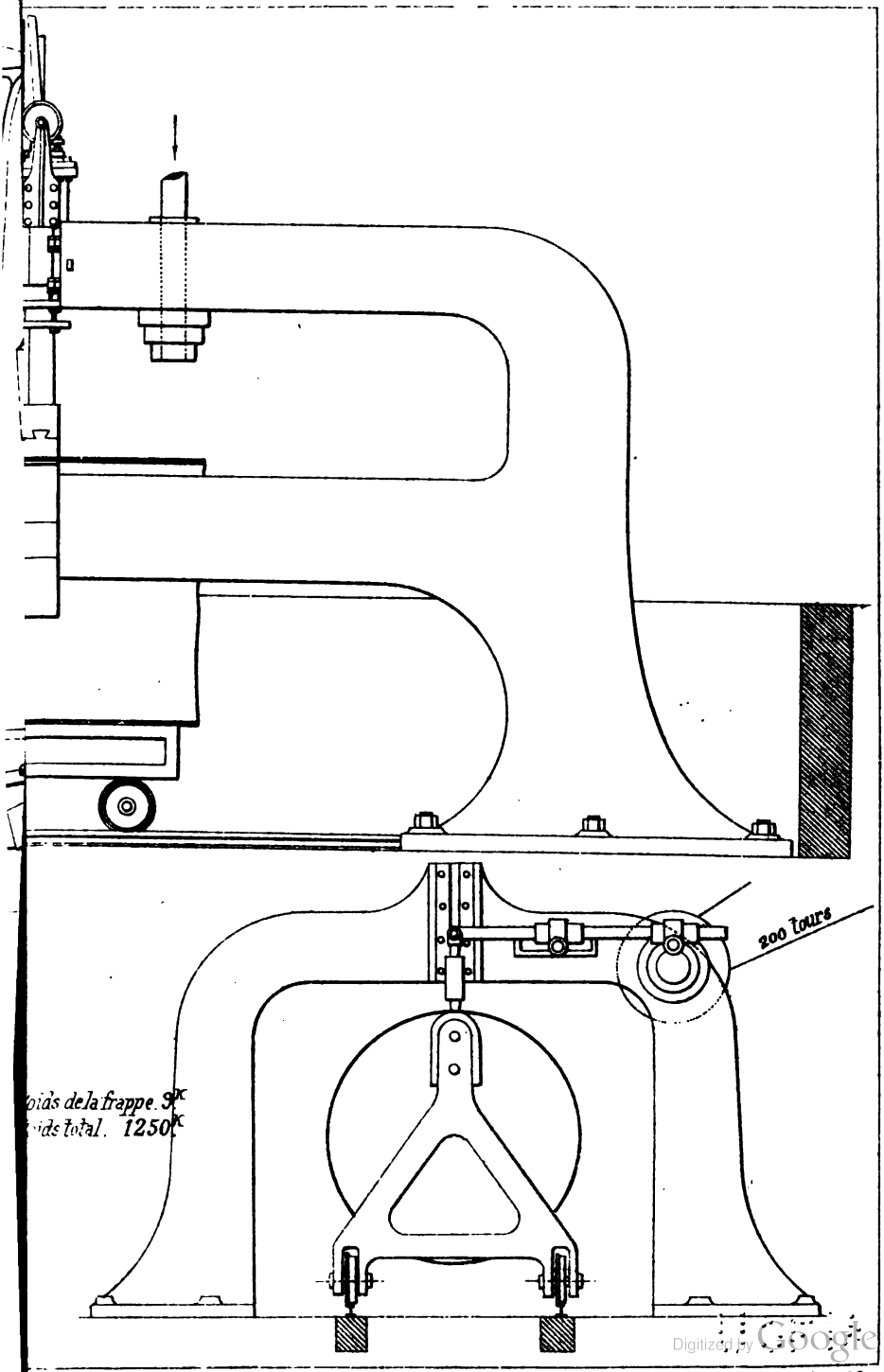
Digitized by Google

Digitized by Google

Digitized by Google



Digitized by Google



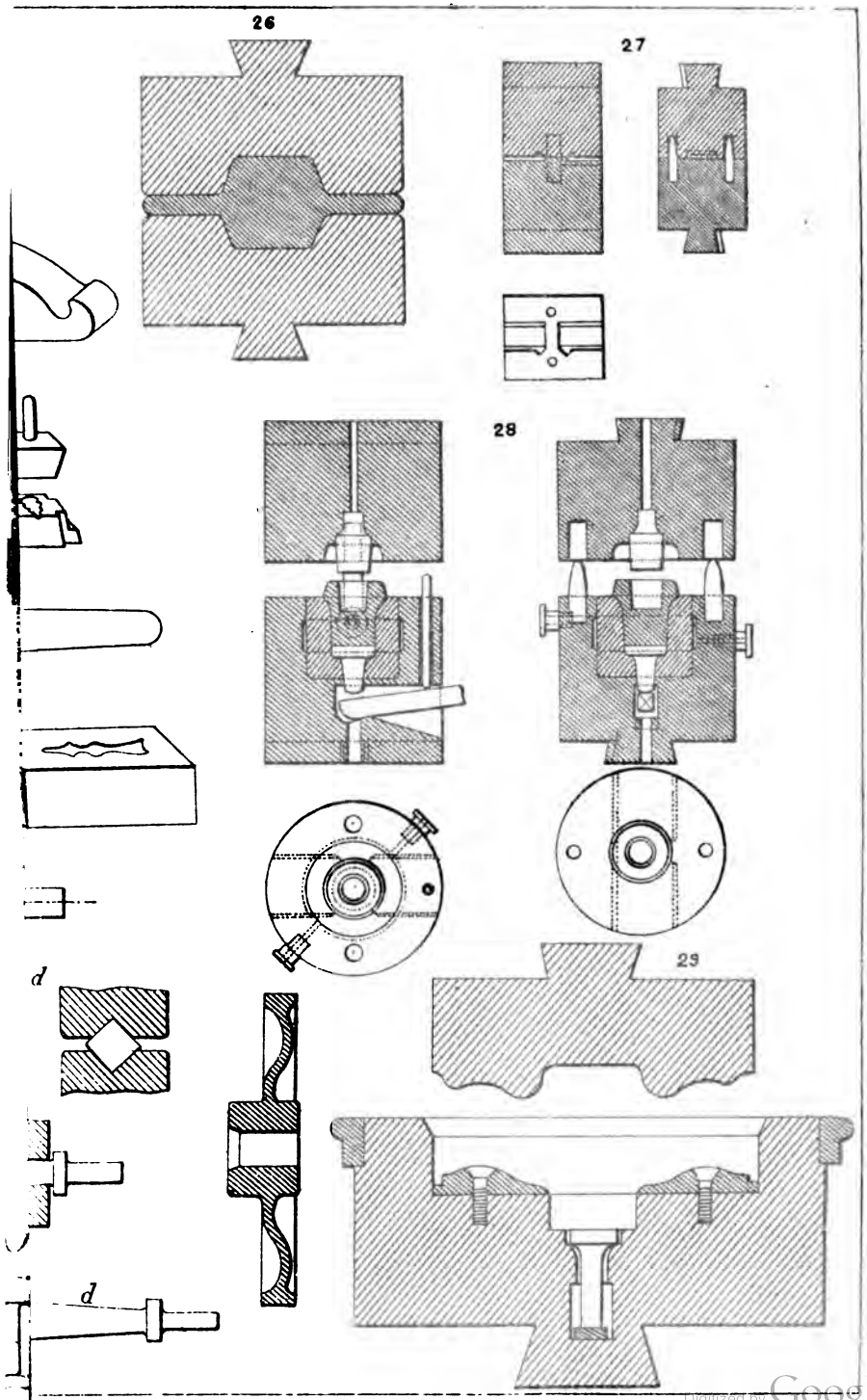
Digitized by Google

IMP. CHAIX - PARIS - 4944-96

Digitized by Google

Digitized by Google

Digitized by Google



IMP. CHAIX - PARIS - 4942 - 96

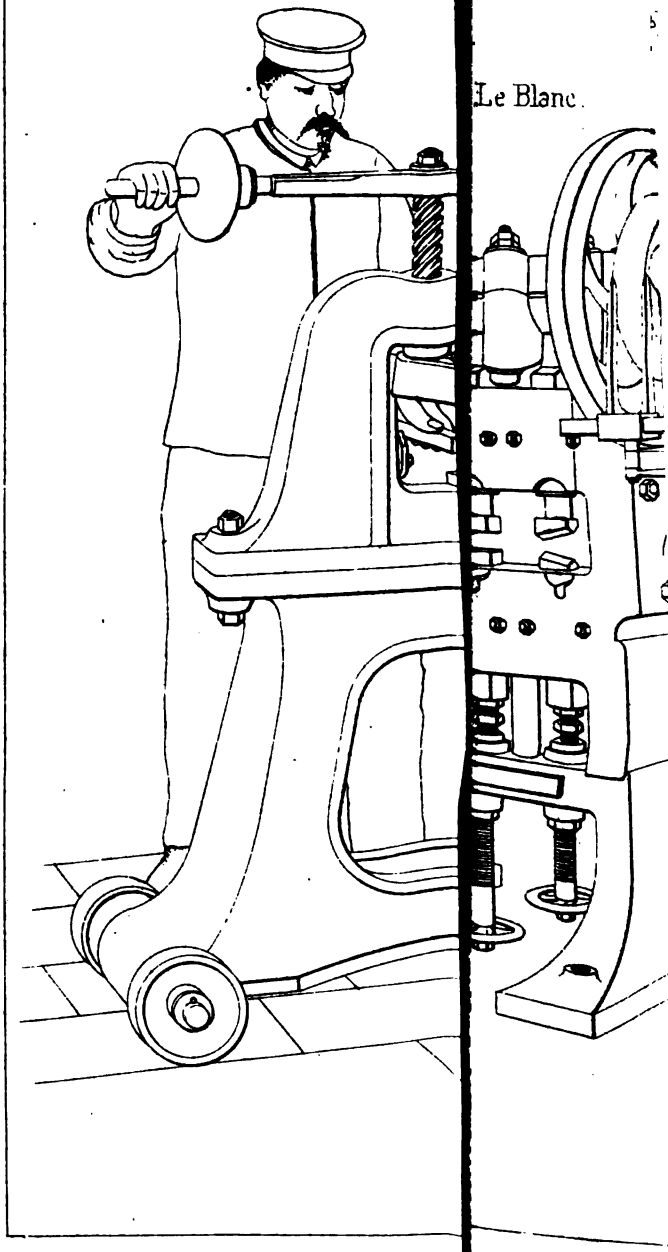
Digitized by Google

Digitized by Google

Digitized by Google

1. Modèle D HINES A

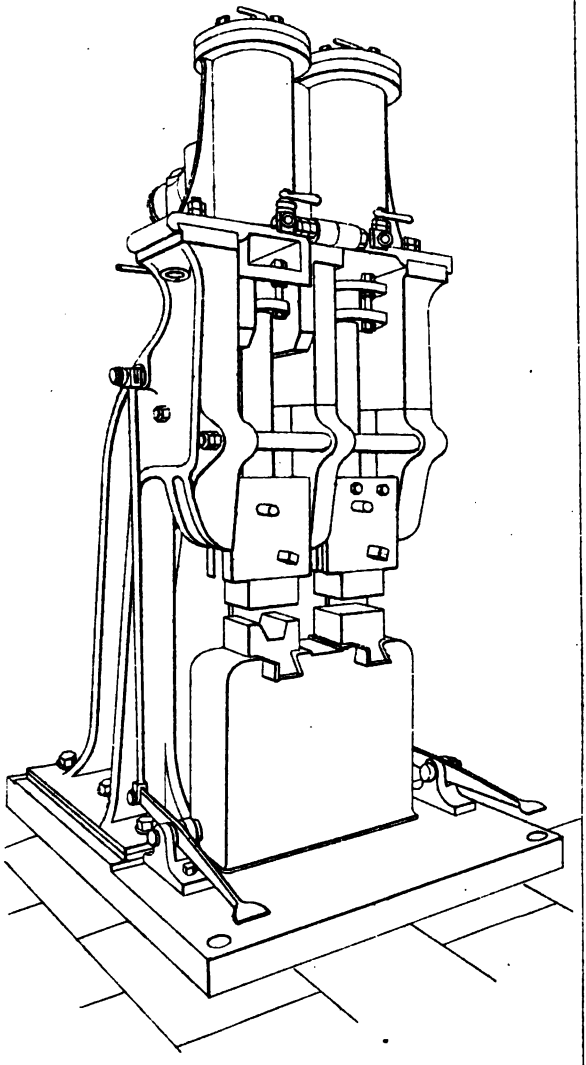
Le Blanc.



Digitized by Google

'AM

eles Massey 4



IMR CHAIX · PARIS - 10914 - 98

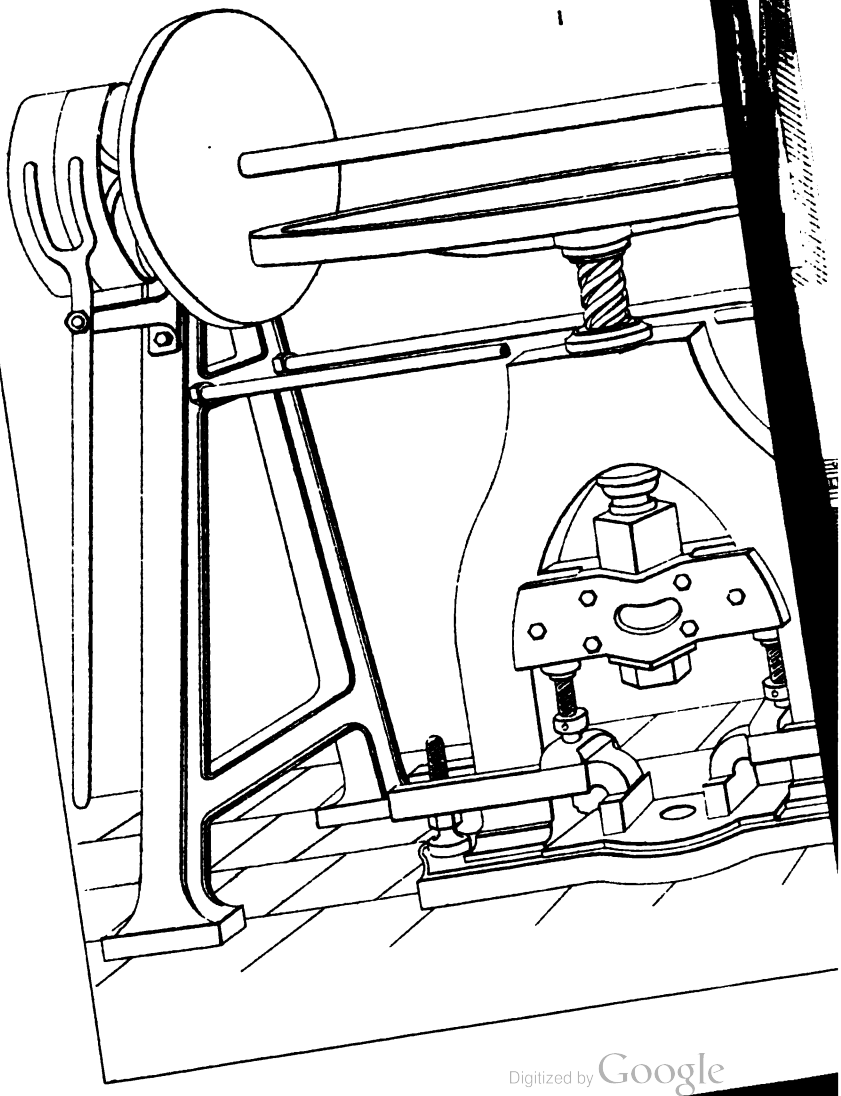
Digitized by Google

Digitized by Google

Digitized by Google

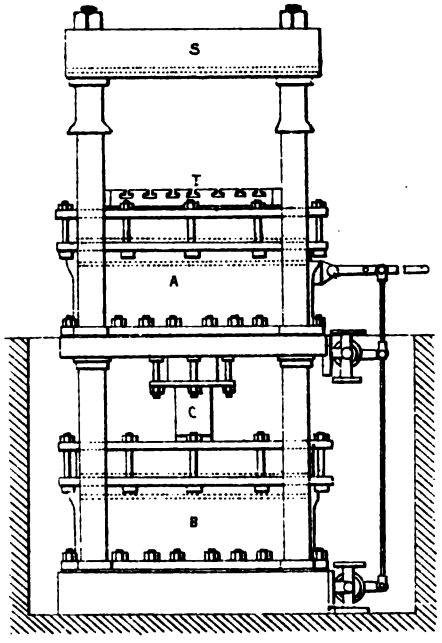
ENGINS D'ÉTAMPAGE E

Presse à vis dite à balancier et à f



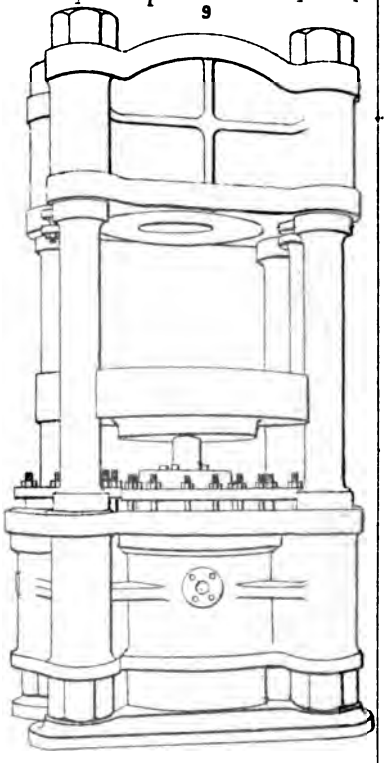
Digitized by Google

apeur (Modele Massey)



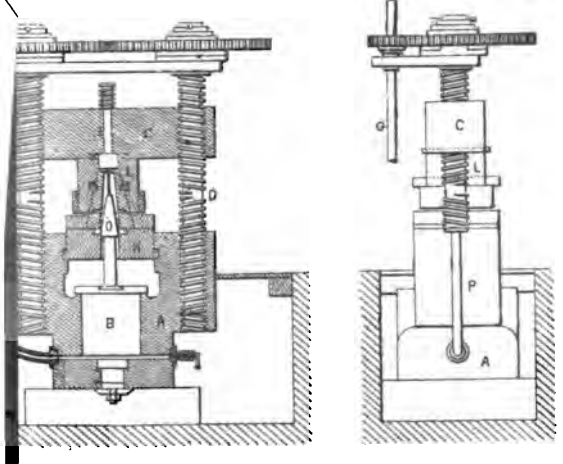
Presse hydraulique (Modèle Henry Berry)

9

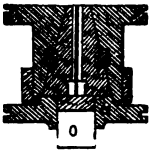


Presse Brunon (Modèle 1876)

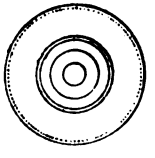
6

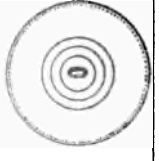


7



8



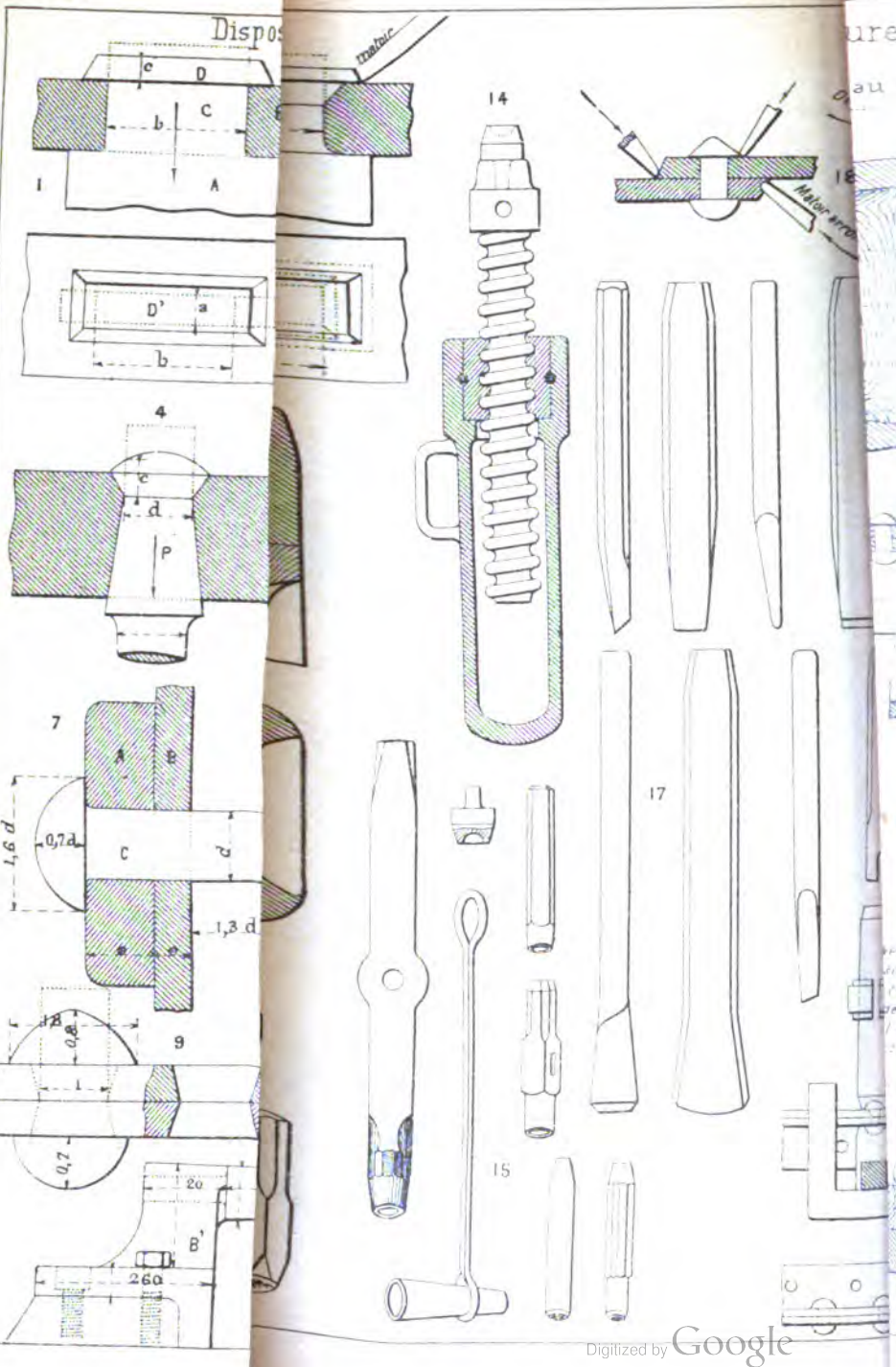


Digitized by Google

IMP. CHAIX R. BERGÈRE 20 PARIS — 10918 - 6 98.

Digitized by Google

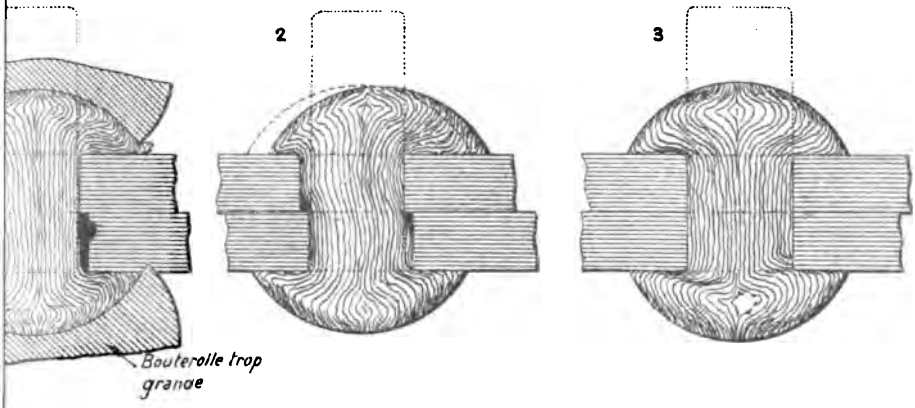
Digitized by Google

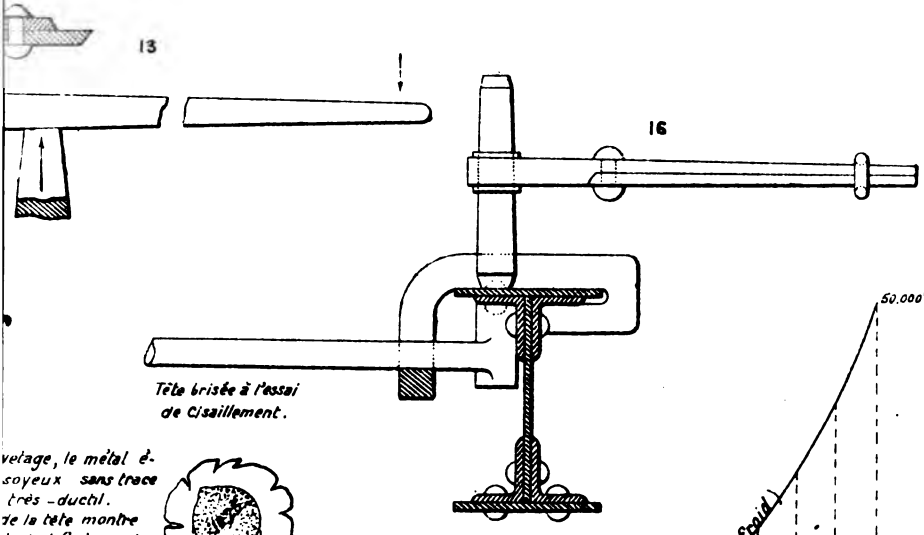


Digitized by Google

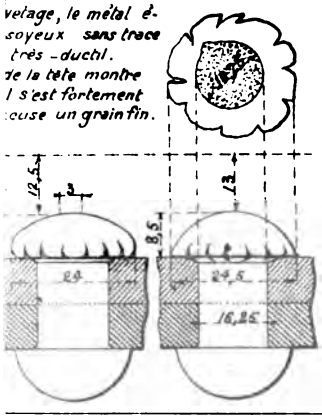
ures à froid et à chaud au marteau et à la machine

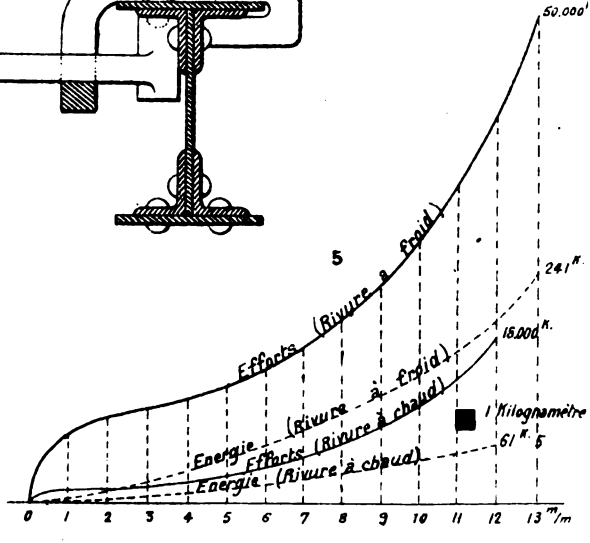
au et à la bouterolle. Rivure à la Machine (Têtes deviées) Rivure à la Machine (Têtes Normales)





velage, le métal é-
soyeux sans trace
très-ductil.
de la tête montre
l s'est fortement
ouse un grain fin.





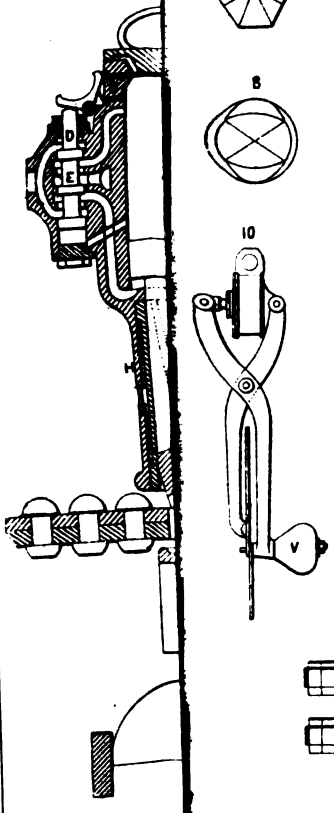
Digitized by Google

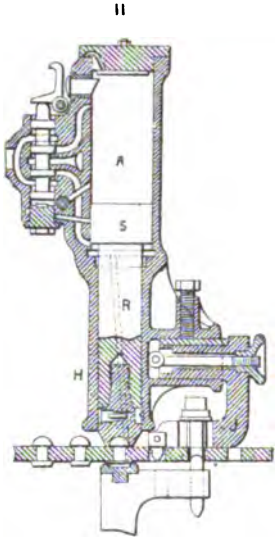
Digitized by Google

Digitized by Google

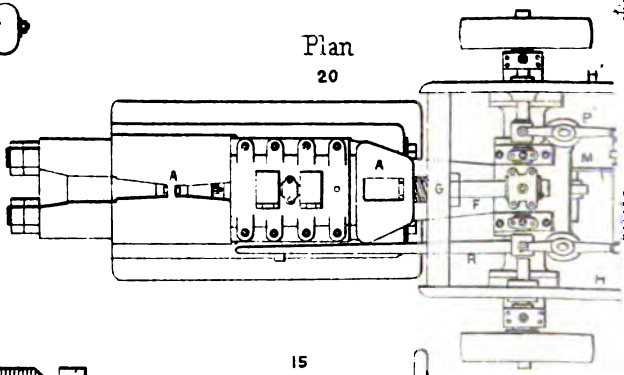
MACHINES A RIV

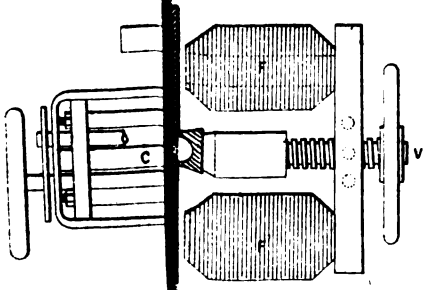
Marteau

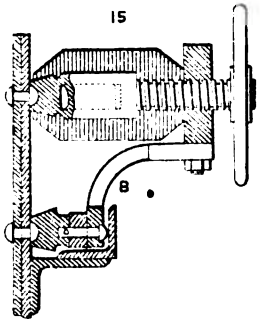




Plan



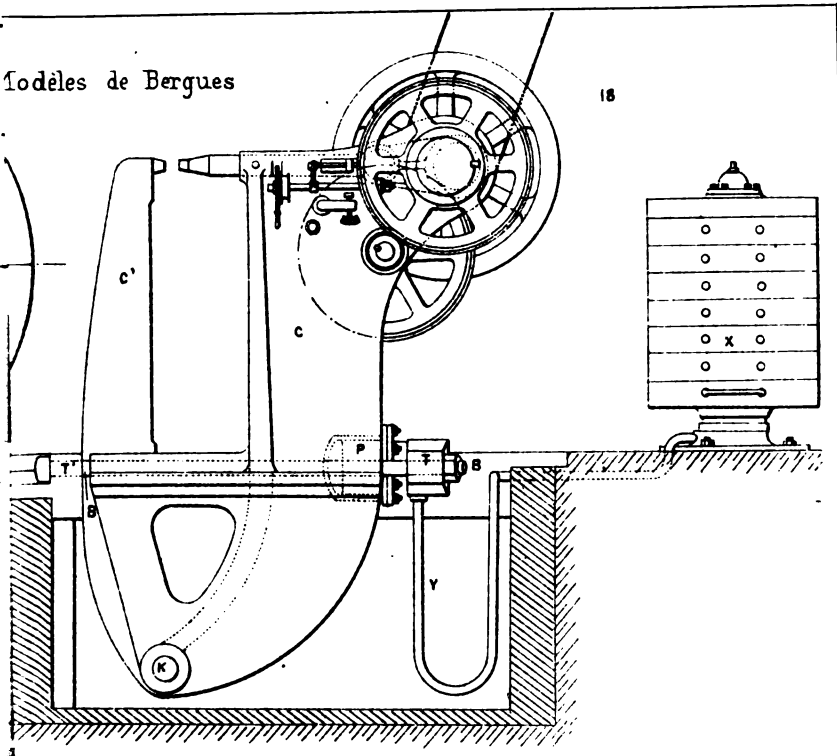




Digitized by Google

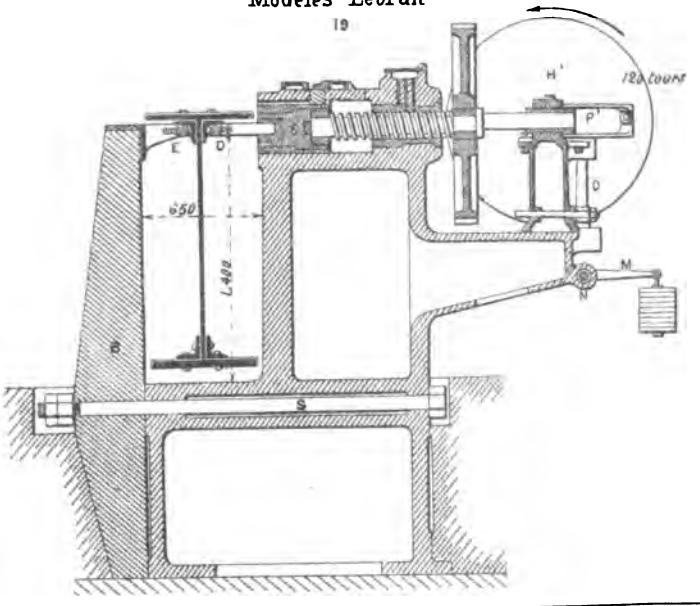
Modèles de Bergues

18



Modèles Lebrun

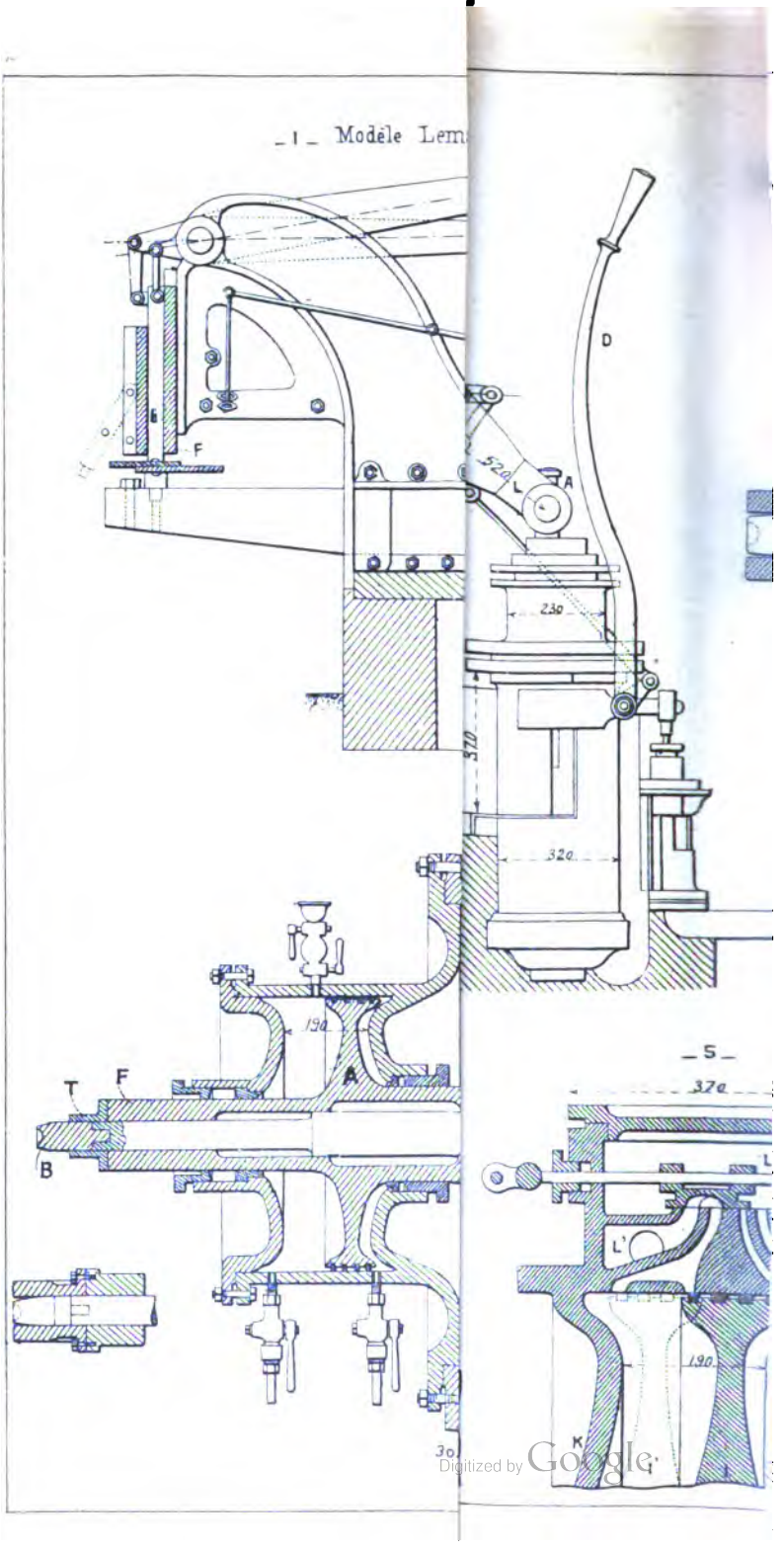
19



Digitized by Google

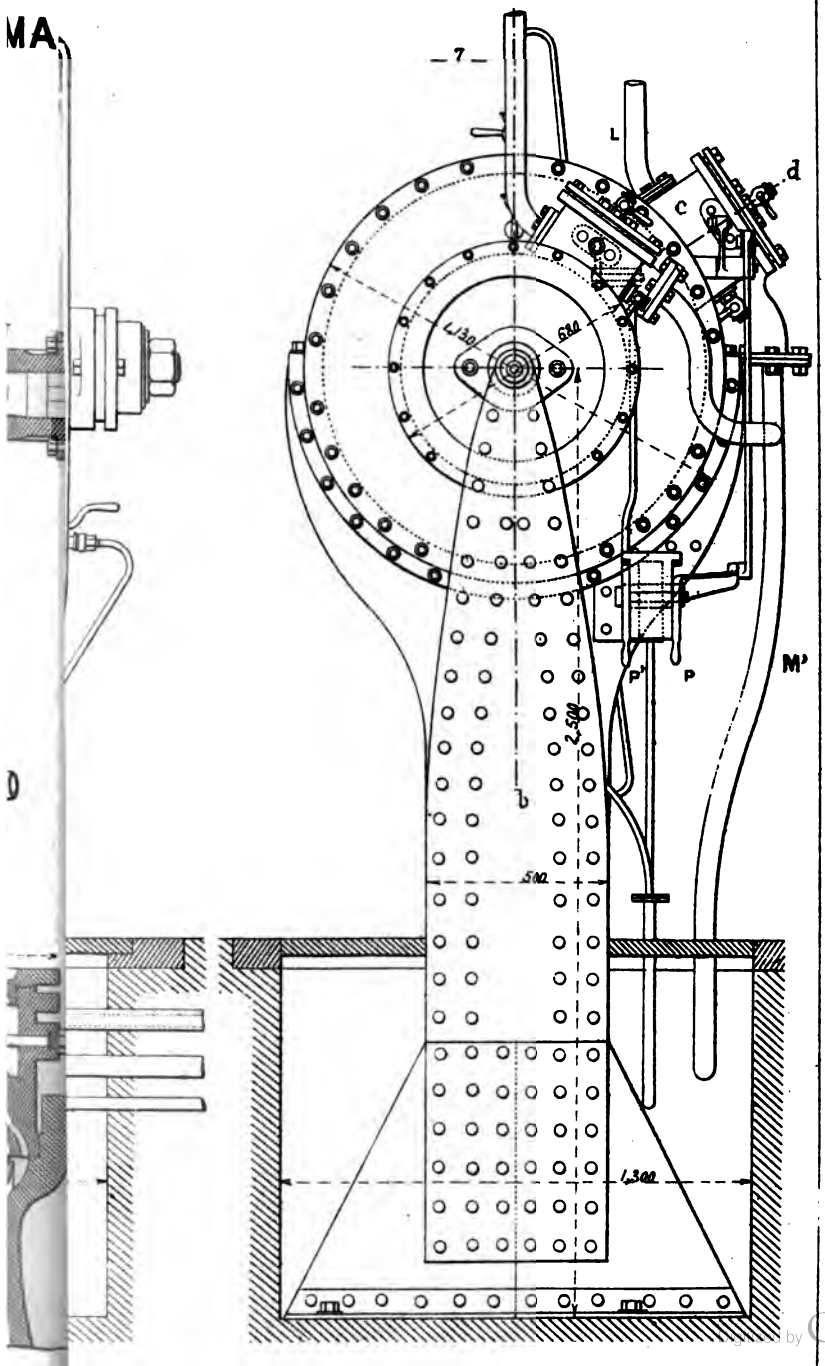
Digitized by Google

Digitized by Google



Digitized by Google

Machine de Gouin

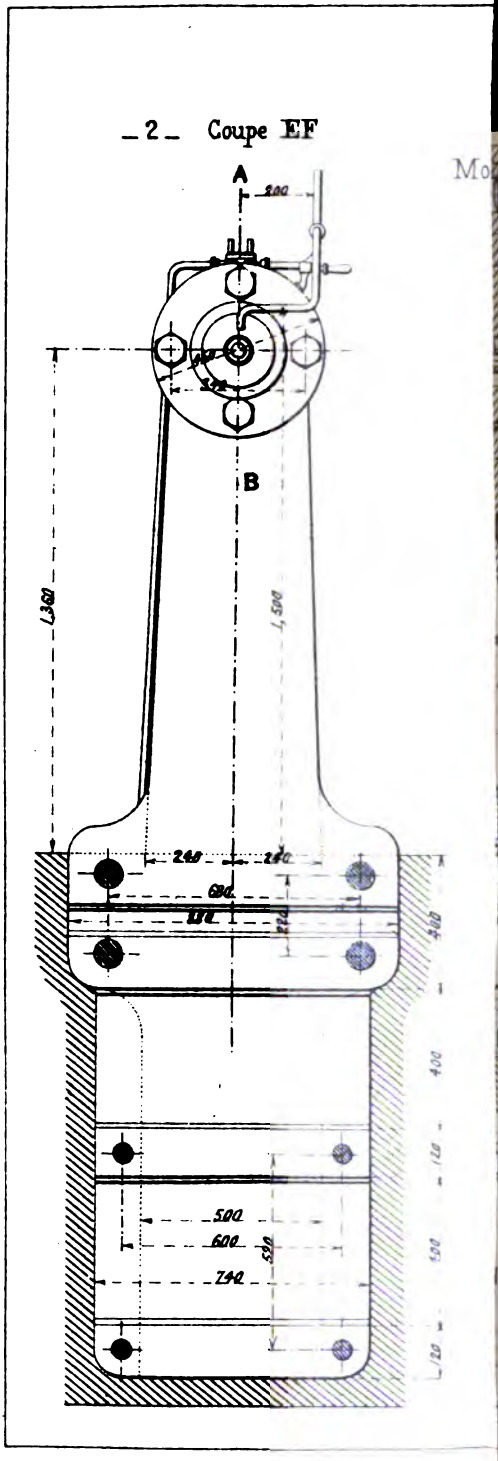


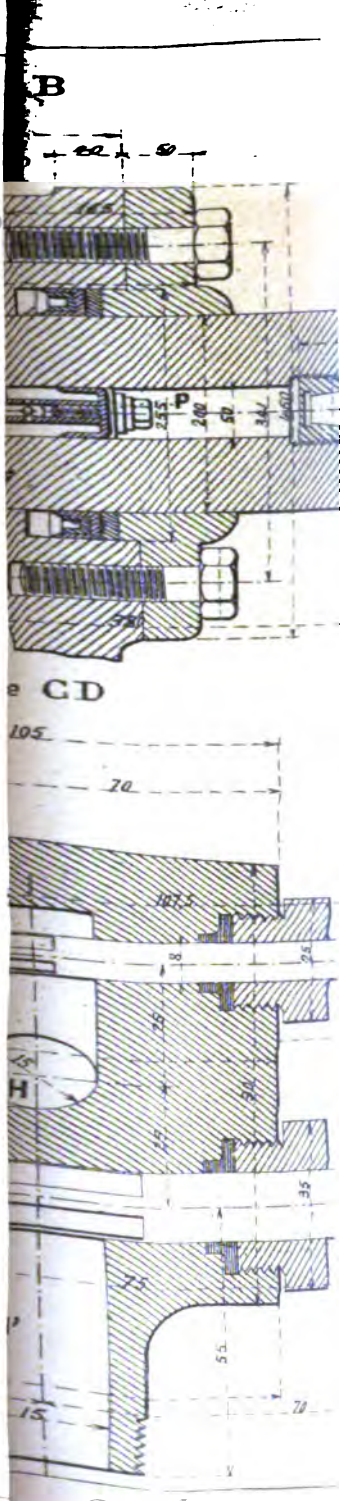
Digitized by Google

IMP. CHAIX - PARIS - 8610-98

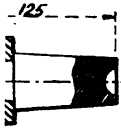
Digitized by Google

Digitized by Google

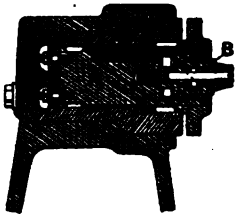




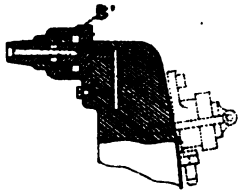
Digitized by Google



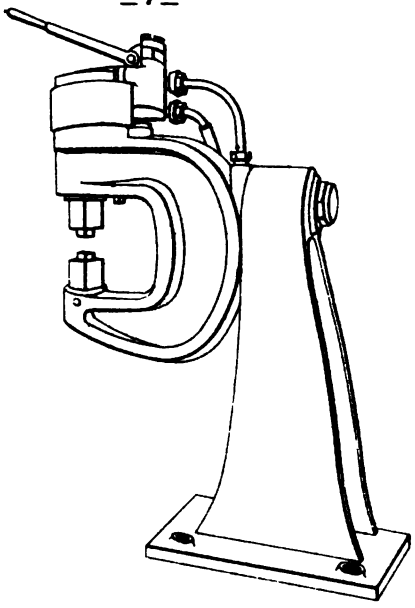
—5—

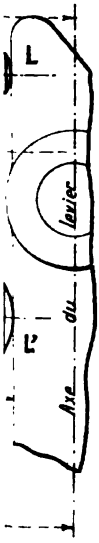


—6—



—7—



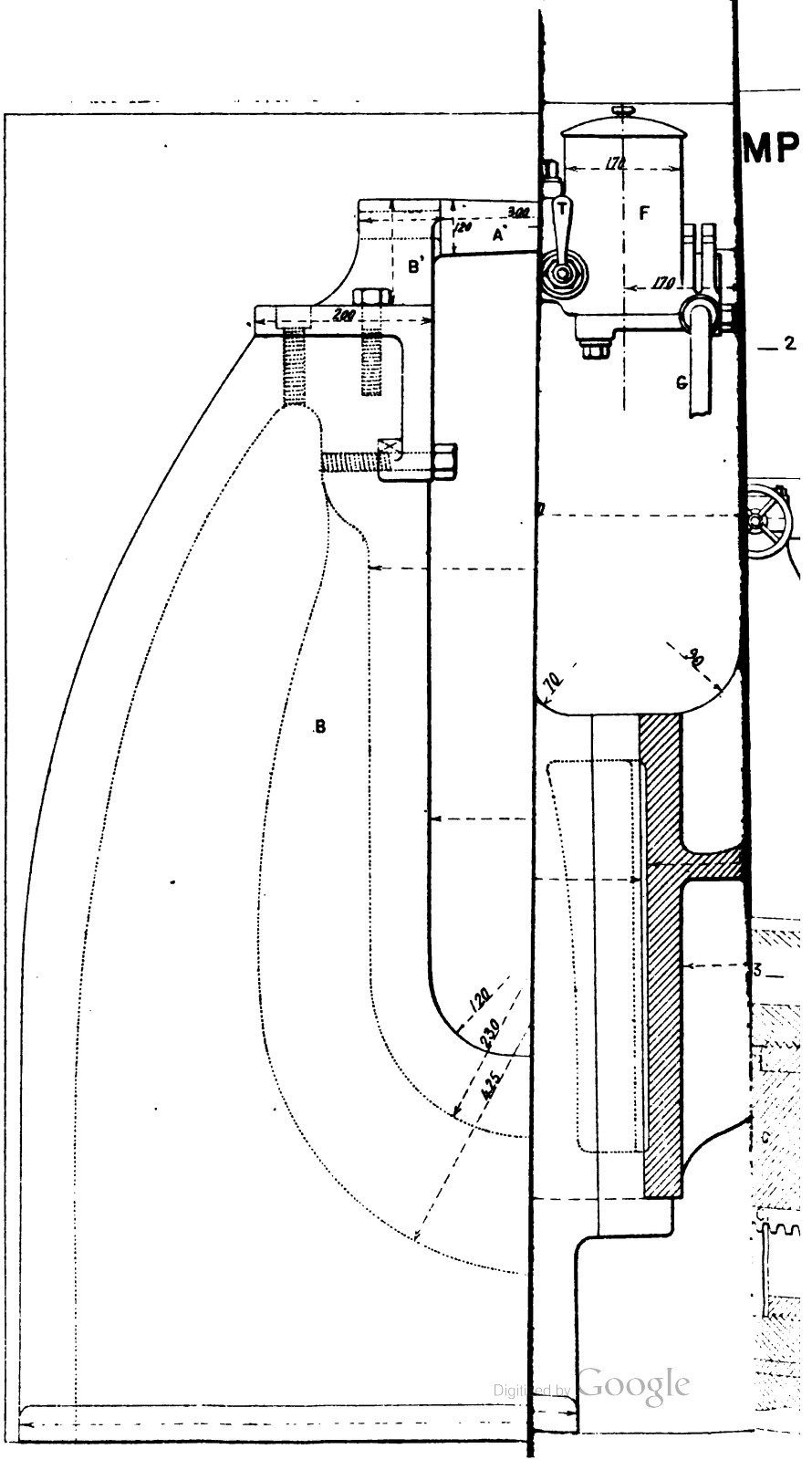


IMP. CHAIX - PARIS - 7320-96

Digitized by Google

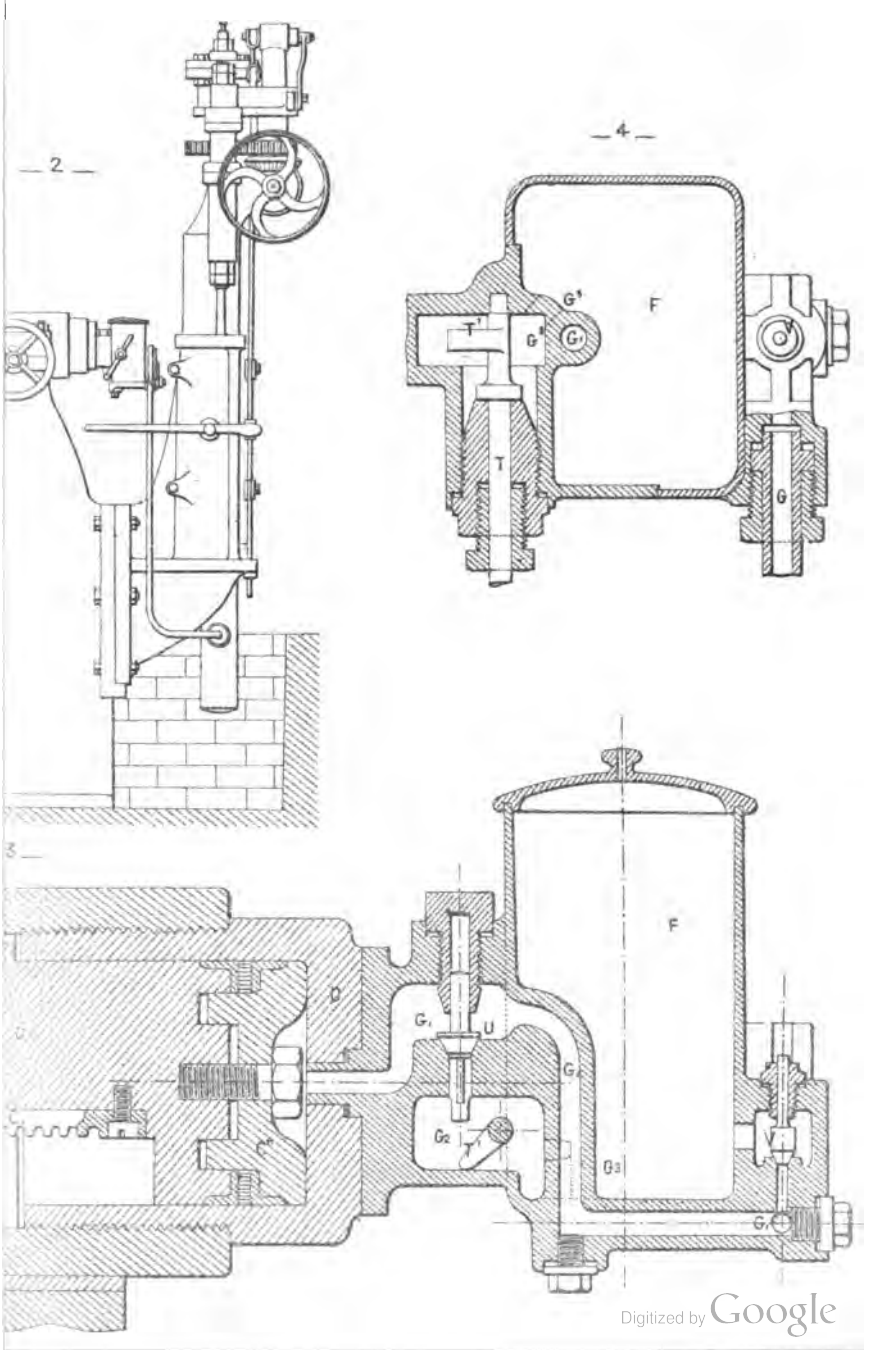
Digitized by Google

Digitized by Google



Digitized by Google

MPRESSEUR DIRECT (Systême Delaloe-Piat)

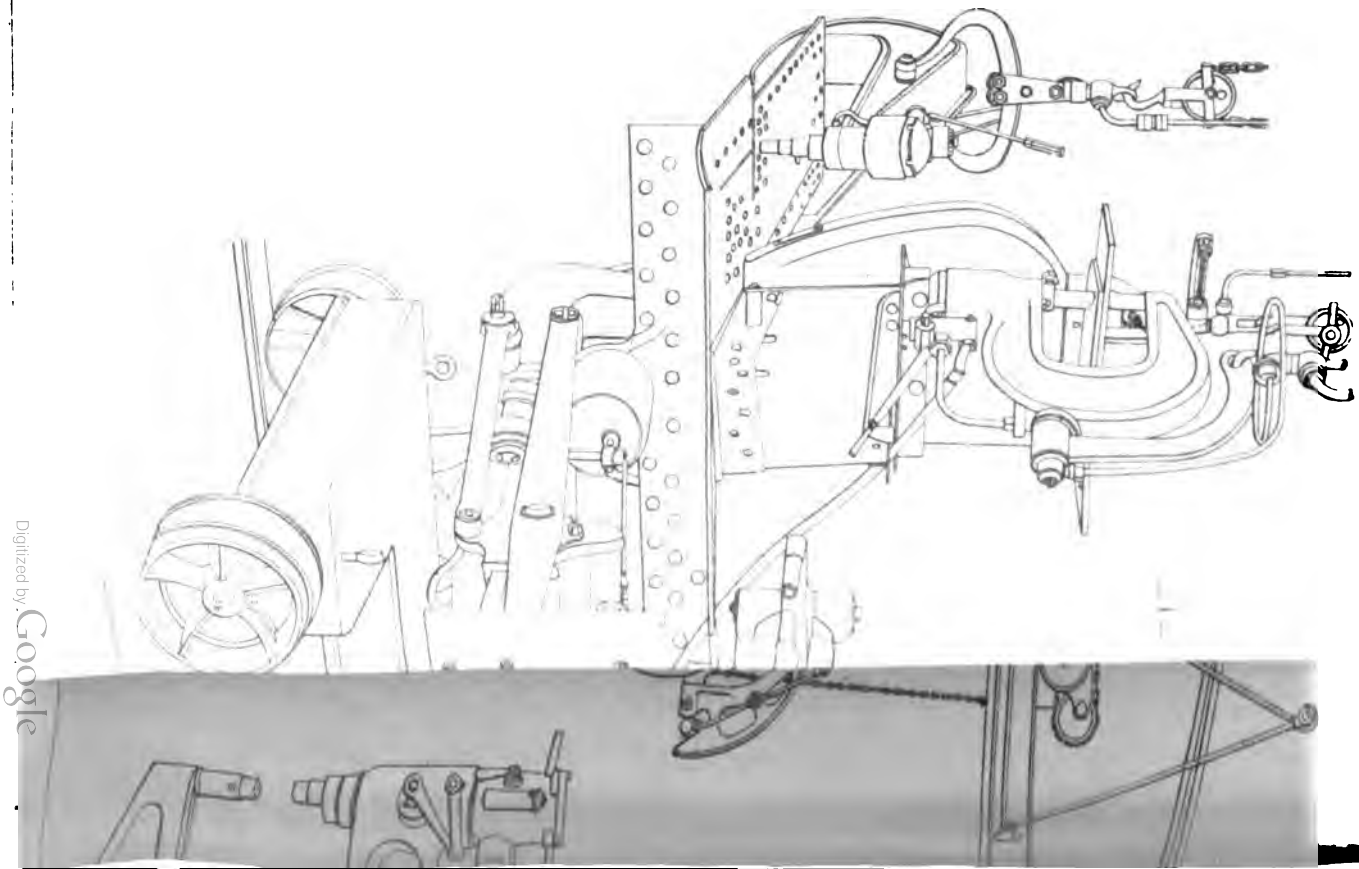


Digitized by Google

IMP. CHAIX - PARIS - 7316 - 20

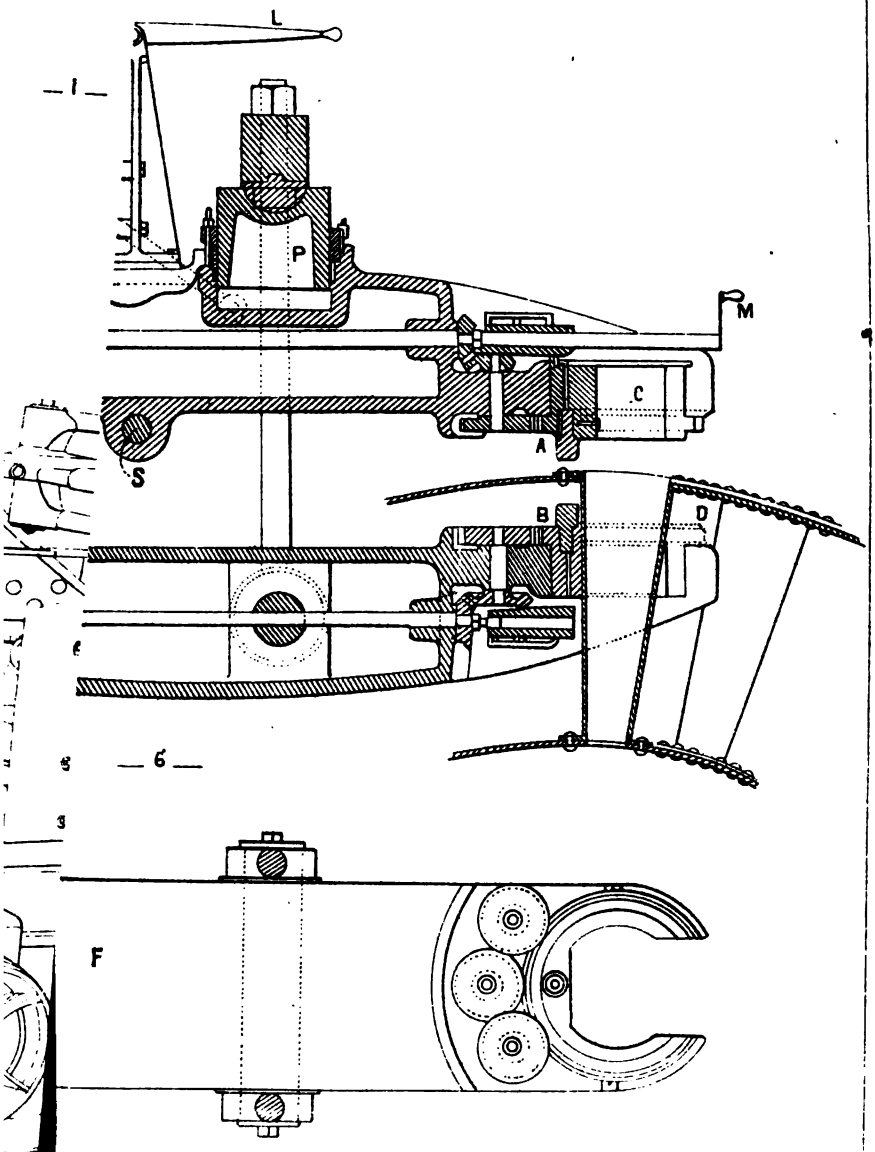
Digitized by Google

Digitized by Google



Digitized by Google

le Sellers



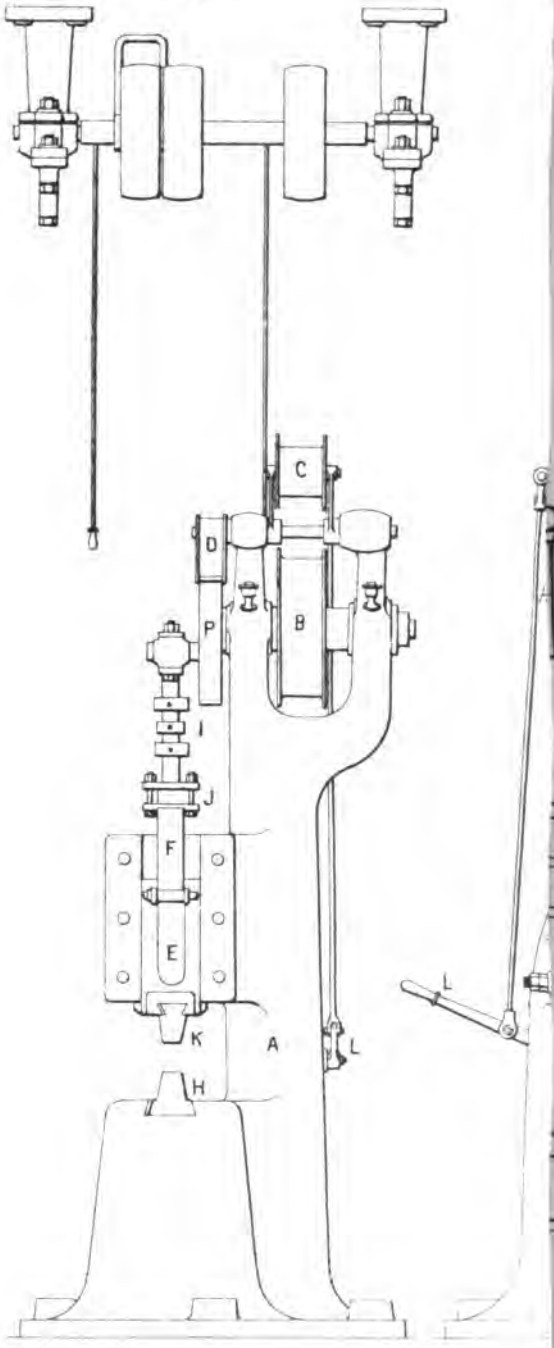
Digitized by Google

IMP CHAIX - PARIS - 7314-96

Digitized by Google

Digitized by Google

Fig. 1.

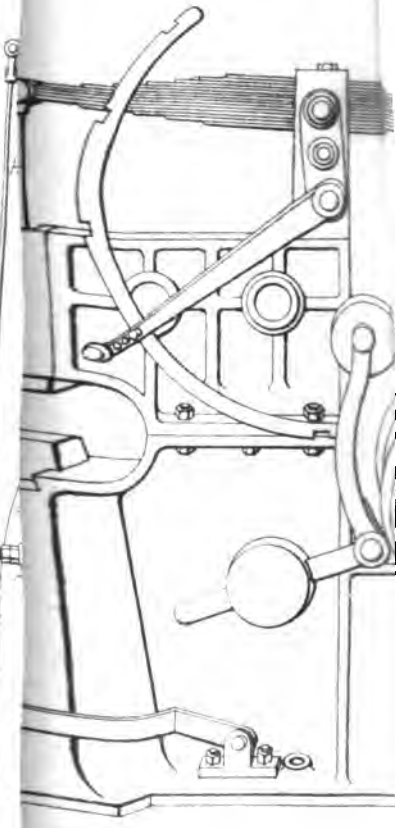


Avril 1896

X – PILONS MÉC

Modèle de Both

Fig. 4.

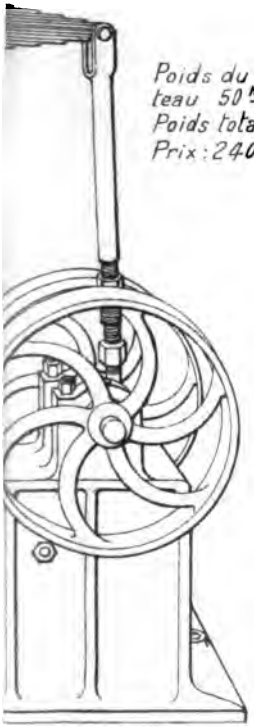


Digitized by Google

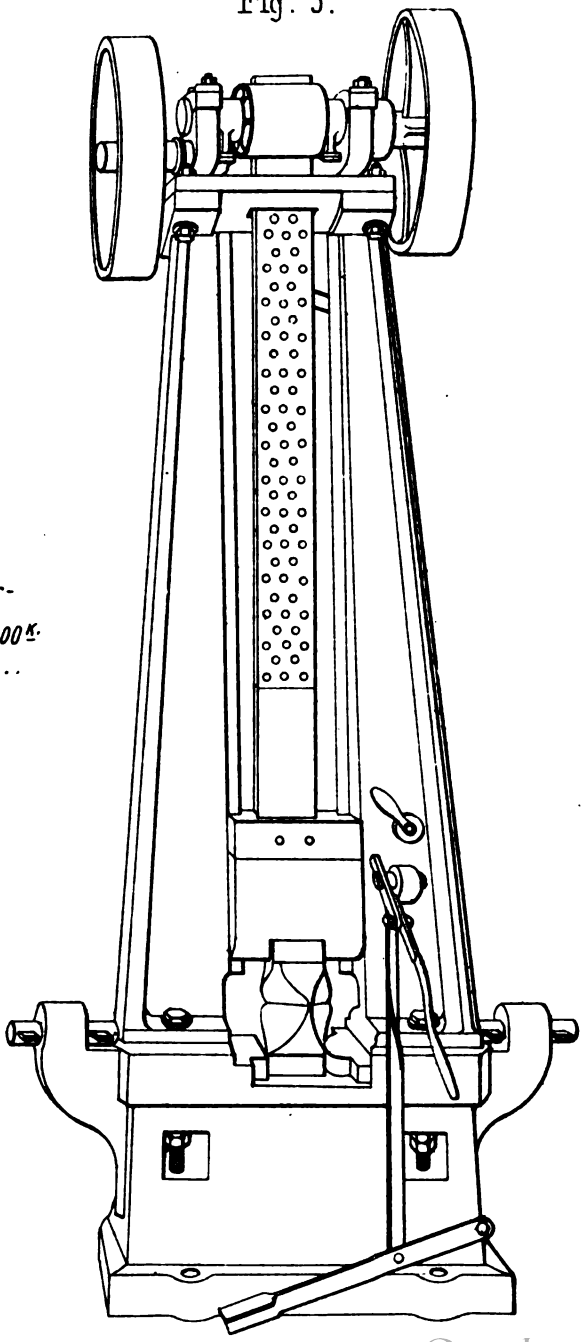
Modèle de Hasse
Fig. 5.

IQUES

1881)



Poids du marteau 50 K.
Poids total 2200 K.
Prix : 2400 fr. . .



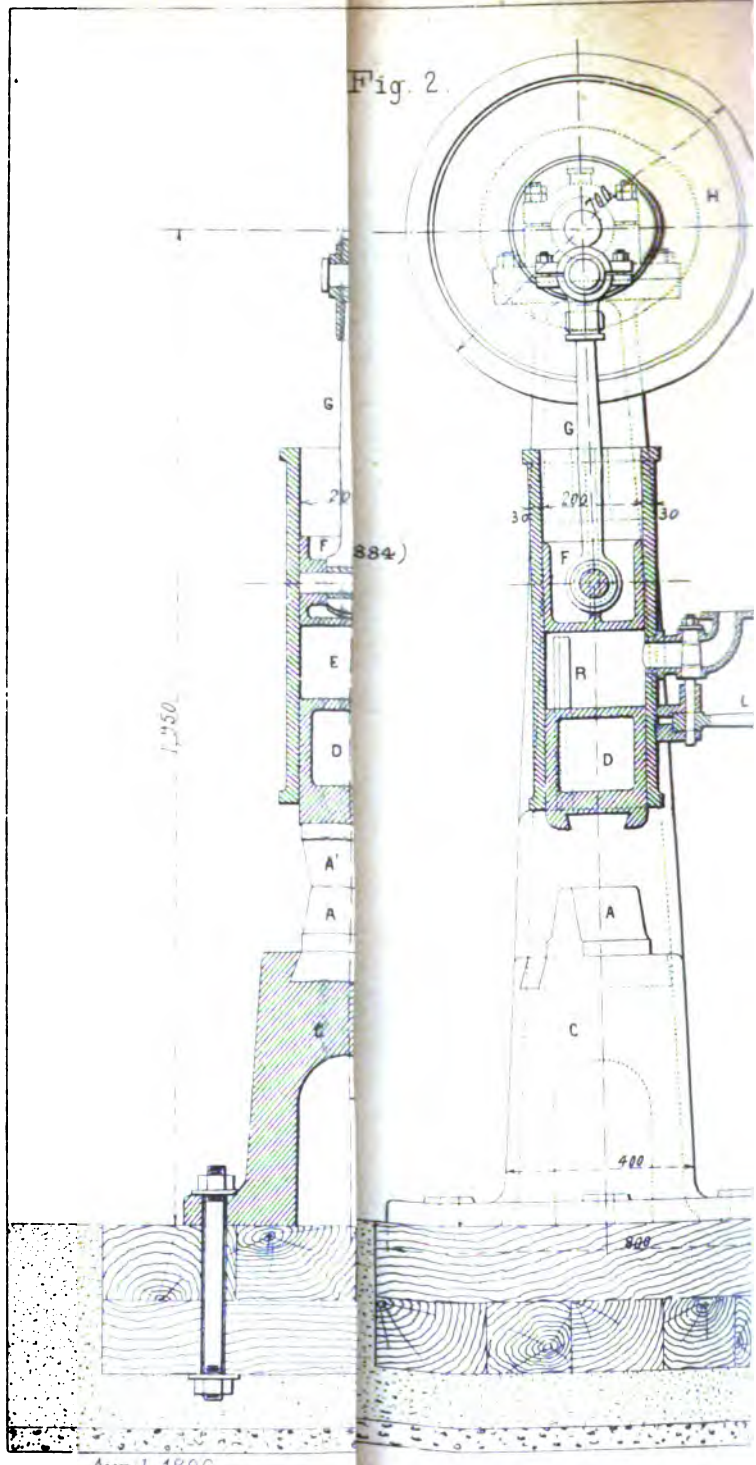
Digitized by Google

IMP CHAIX - PARIS - 25492 - 9

Digitized by Google

Digitized by Google

Fig. 2.



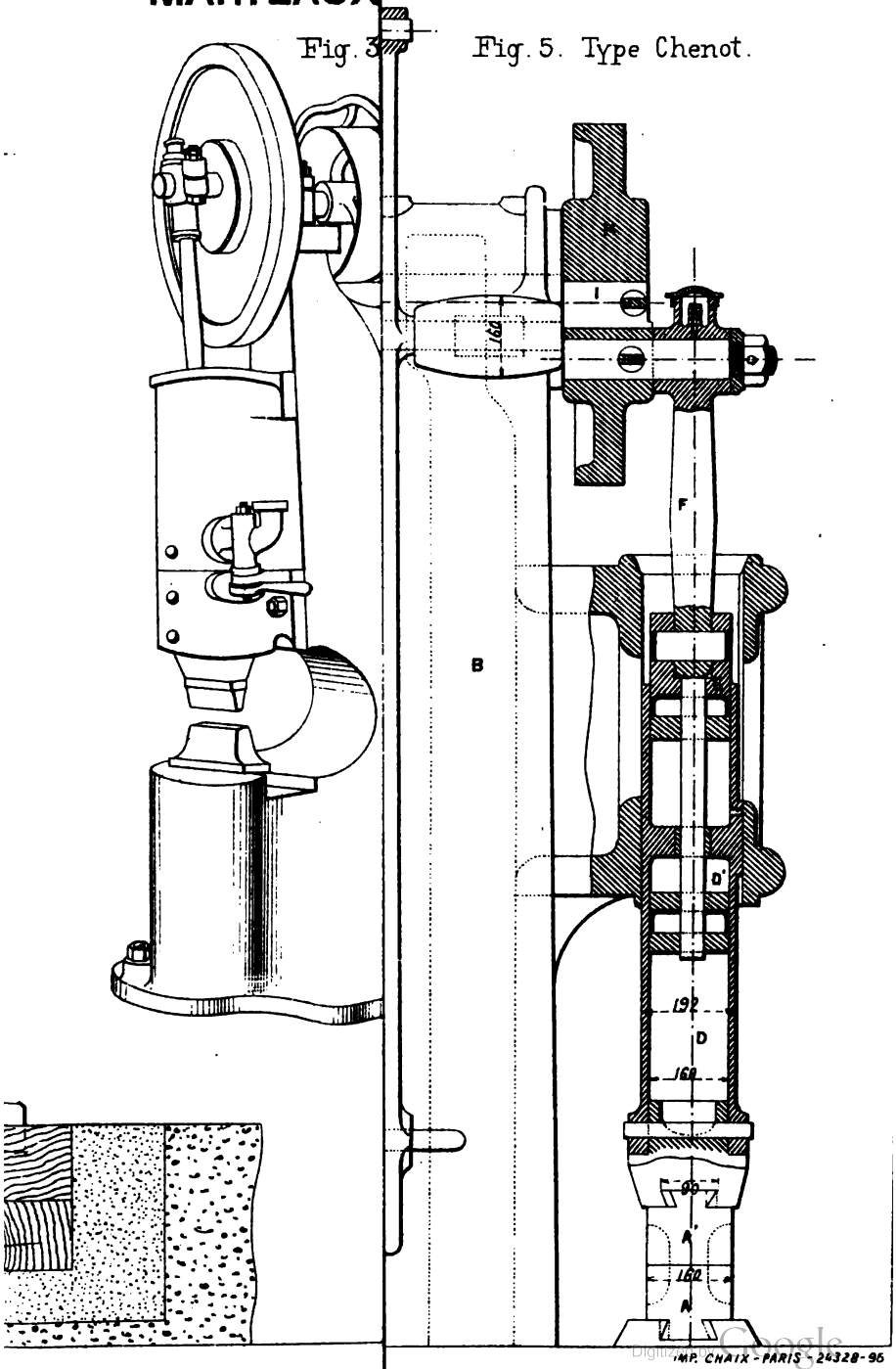
Avril 1896

Digitized by Google

MARTEAUX

Fig. 3

Fig. 5. Type Chenot.



Digitized by Google

IMP. CHAIX - PARIS - 26328-95

Digitized by Google

Digitized by Google

MARTEAUX - PILONS A VAPEUR

Fig. 1.

Marteau-Pilon de Bourdon.
(Modèle 1840)

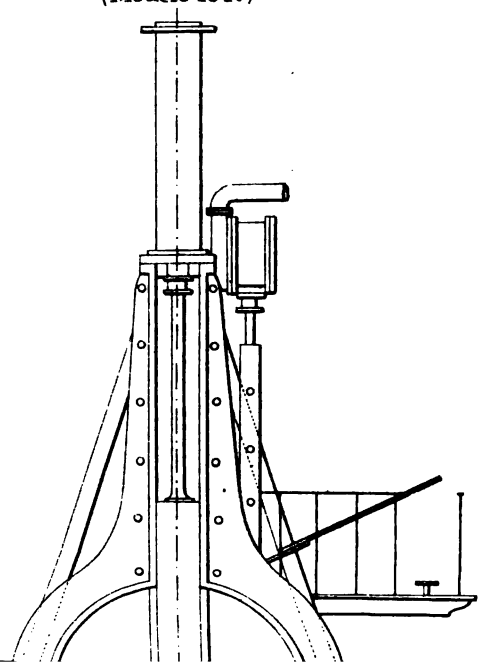
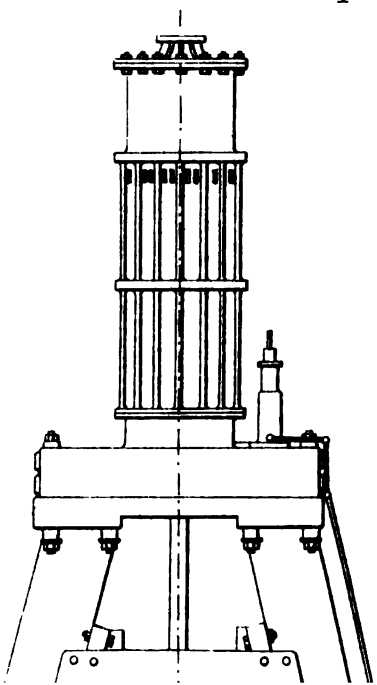


Fig. 2.

Marteau Pilon de 125 tonnes de la Bethlehem Iron Compᵉ
de South-Bethlehem (Pensylvanie)



Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

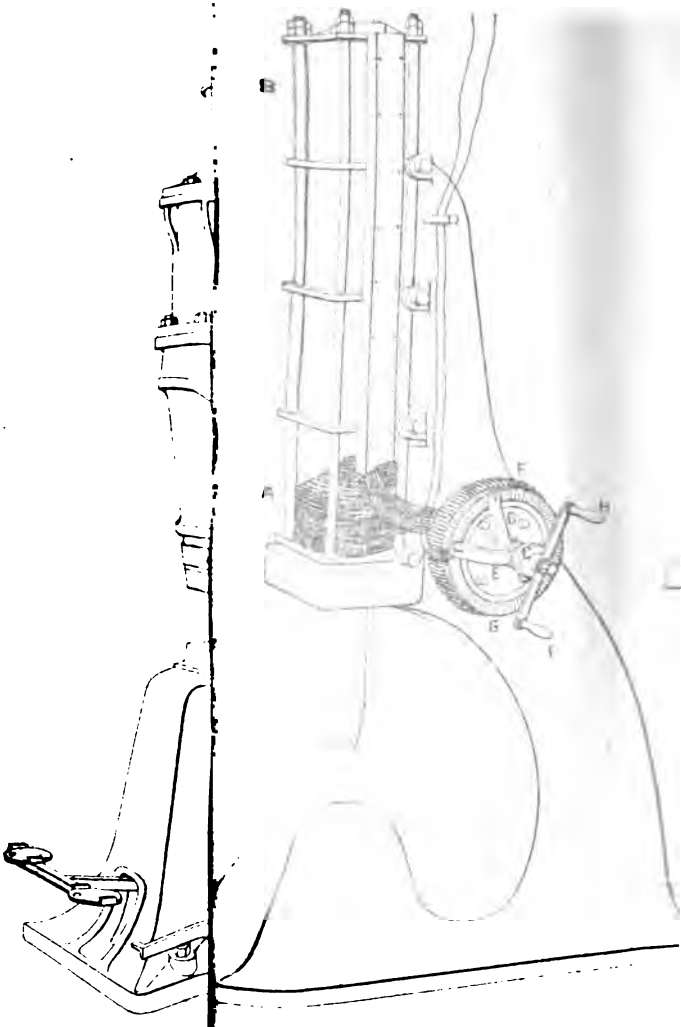
Digitized by Google

Digitized by Google

MAModèles Divers

Pilon à électrique de Mr Marcel Desprez (1892)

Fig. 2.

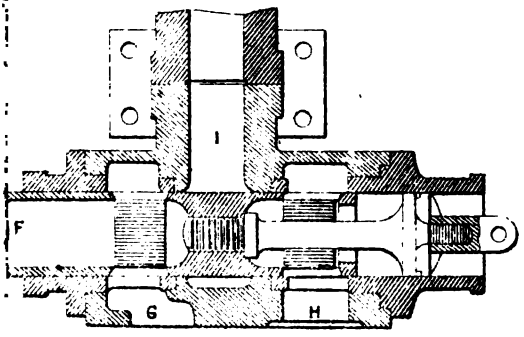


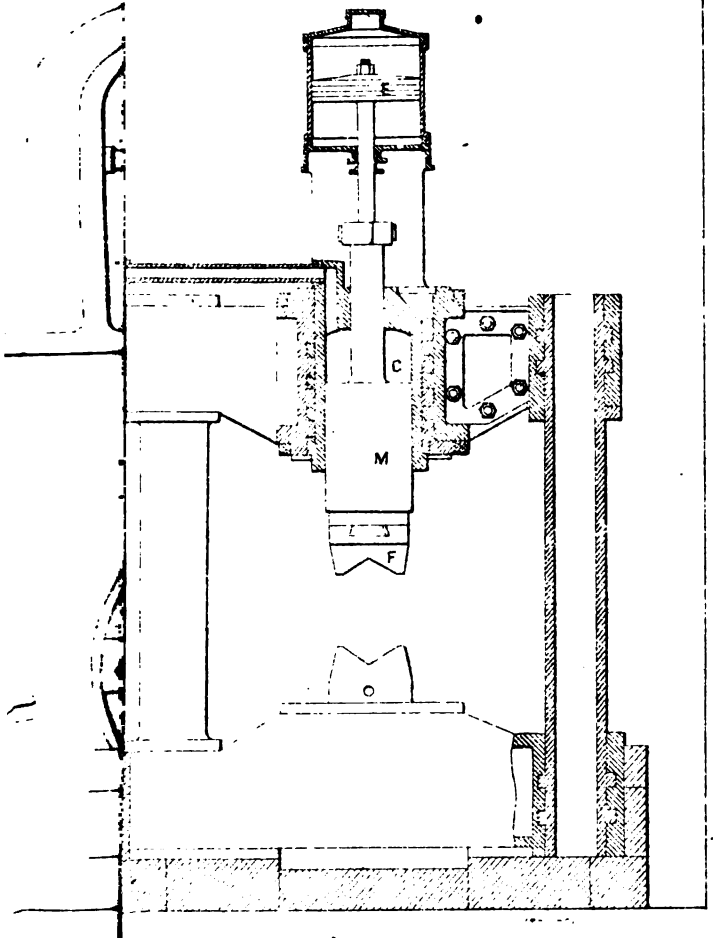
Avril 1892

Digitized by Google

eau él

Fig. 6.

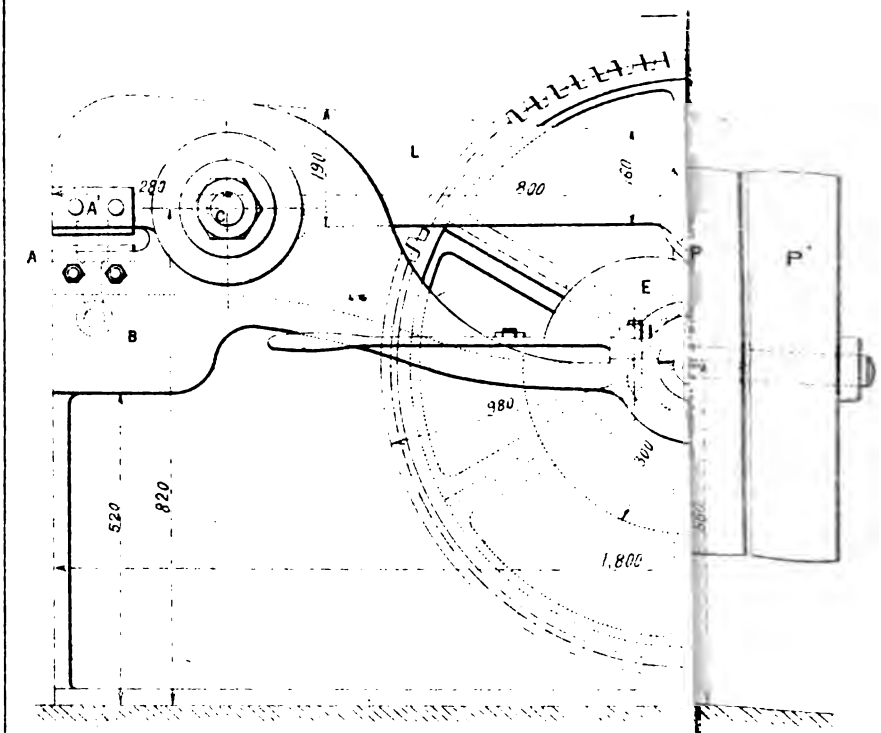


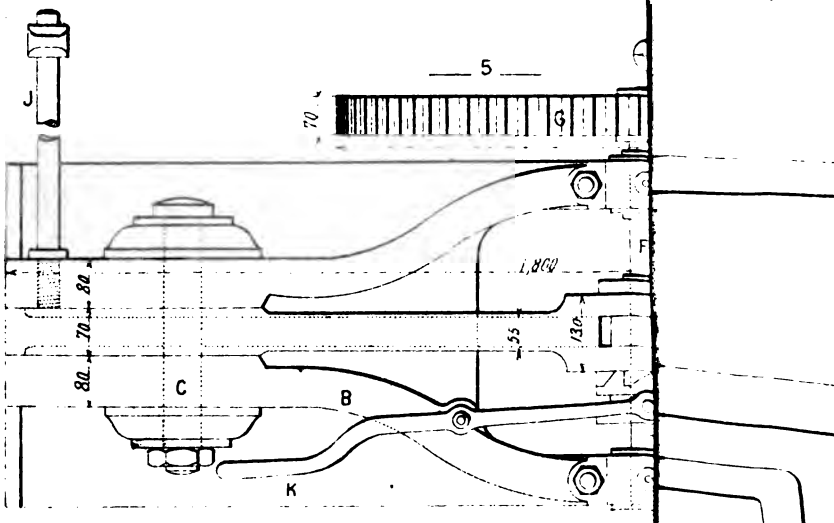


Digitized by Google

Digitized by Google

Digitized by Google

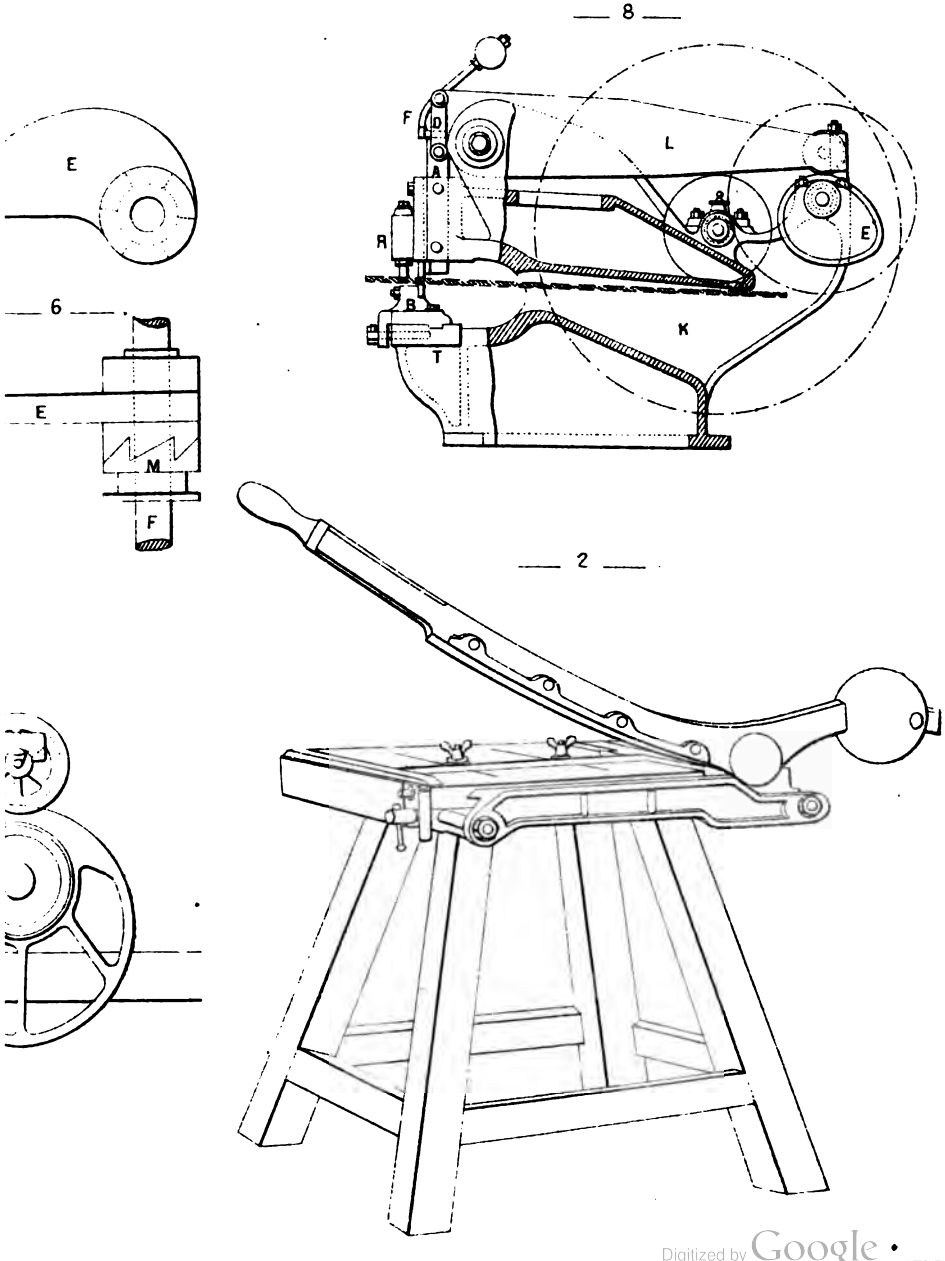




Juillet 1896

Digitized by Google

SAILLES A LEVIER

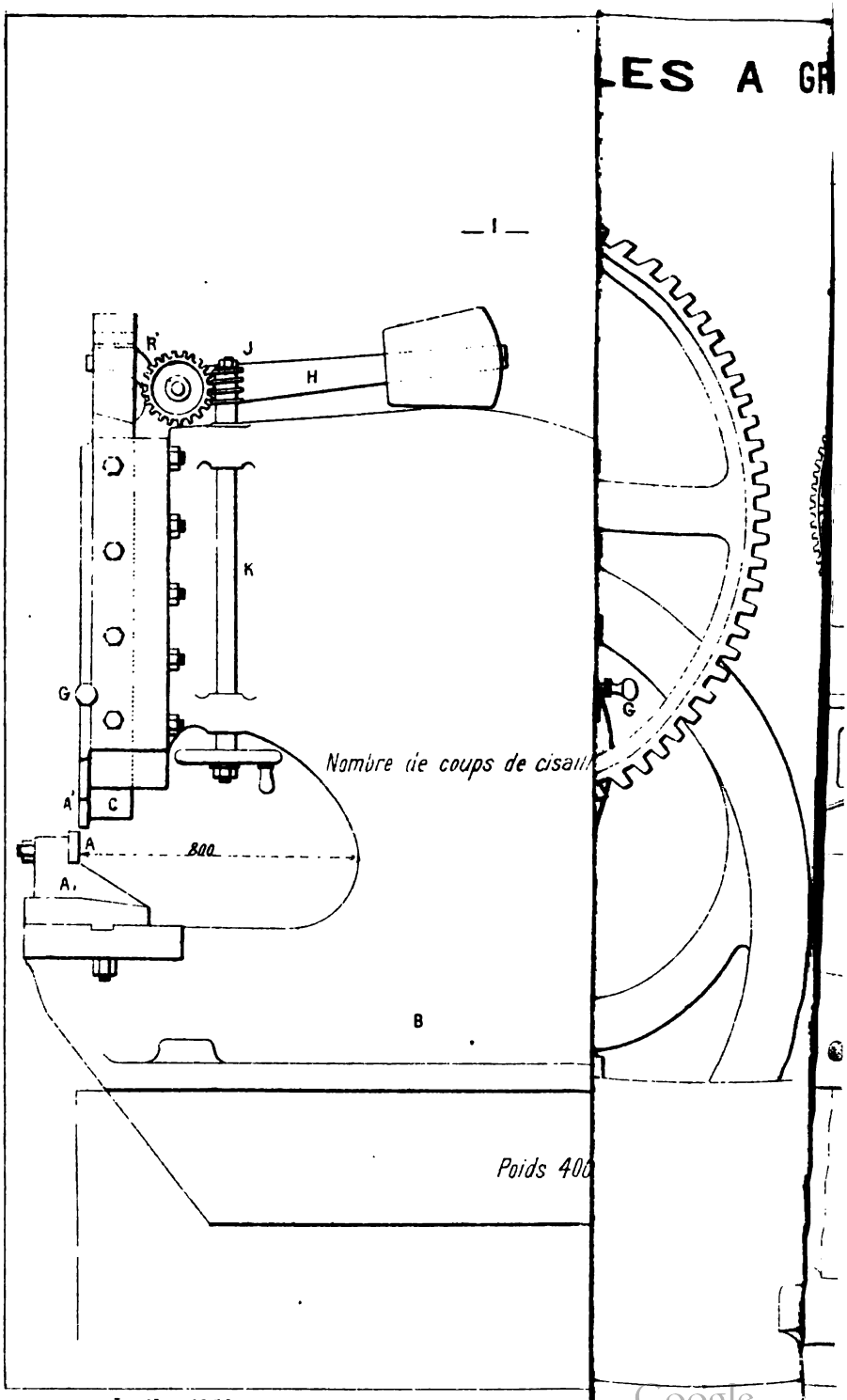


Digitized by Google

IMP CHAIX - PARIS

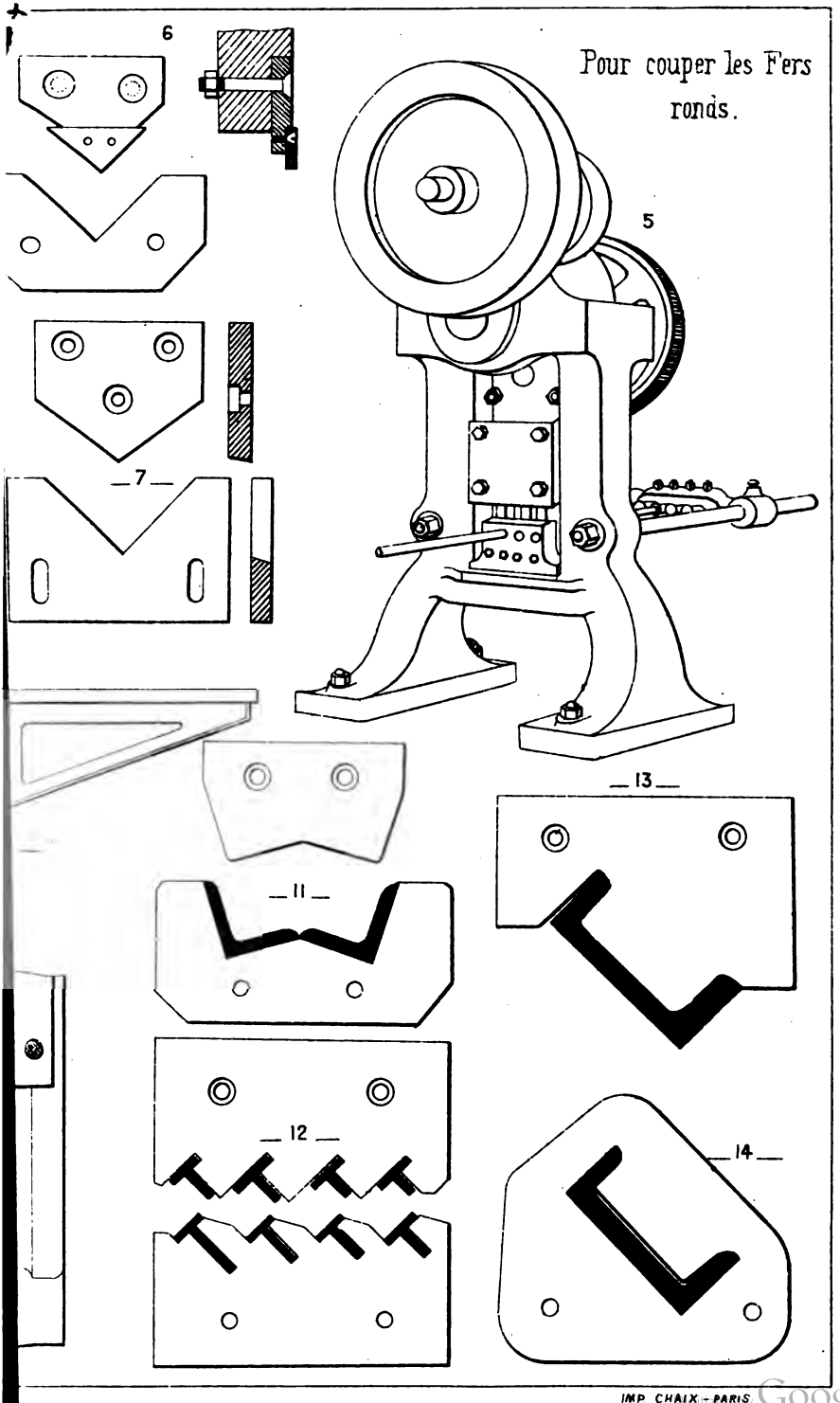
Digitized by Google

Digitized by Google



Juillet 1896

Digitized by Google



IMP. CHAIX - PARIS.

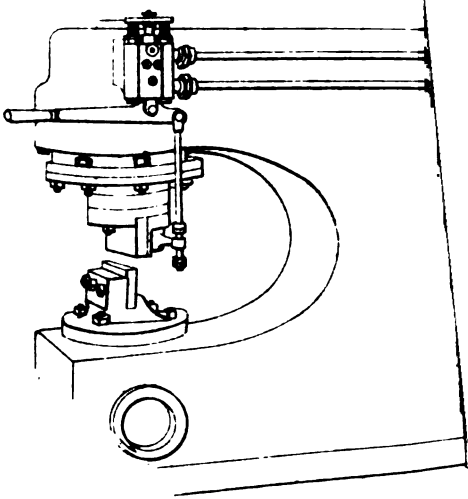
Digitized by Google

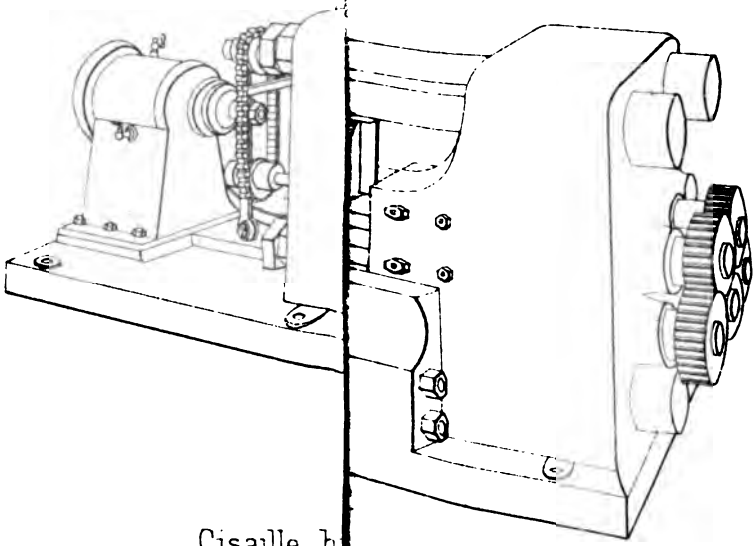
Digitized by Google

Digitized by Google

CISA

Cisaille multiple (Modèle





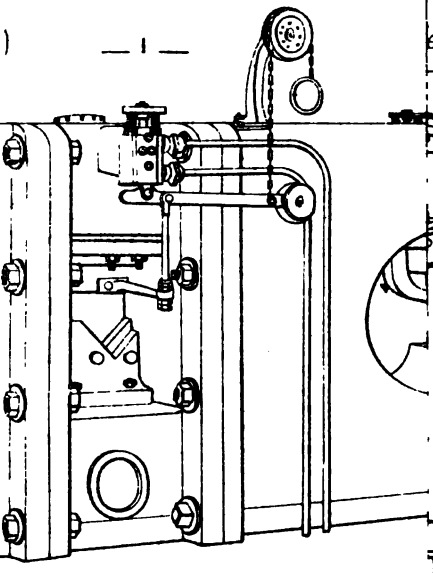
Cisaille h

Digitized by Google

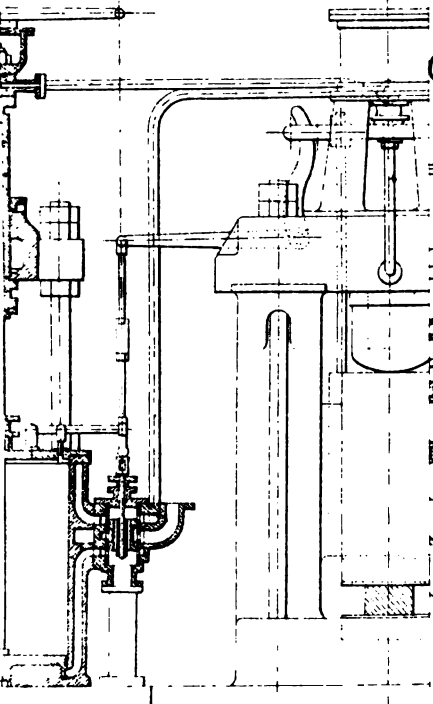
LES HYDRAULIQU

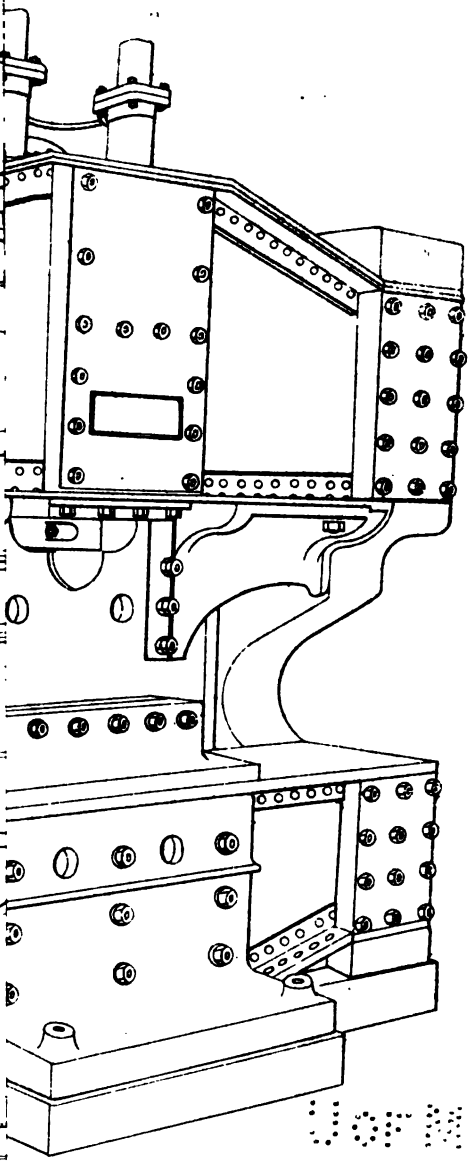
les tôles d'acier jusqu'à

ele Breuer et Schumacher)



3





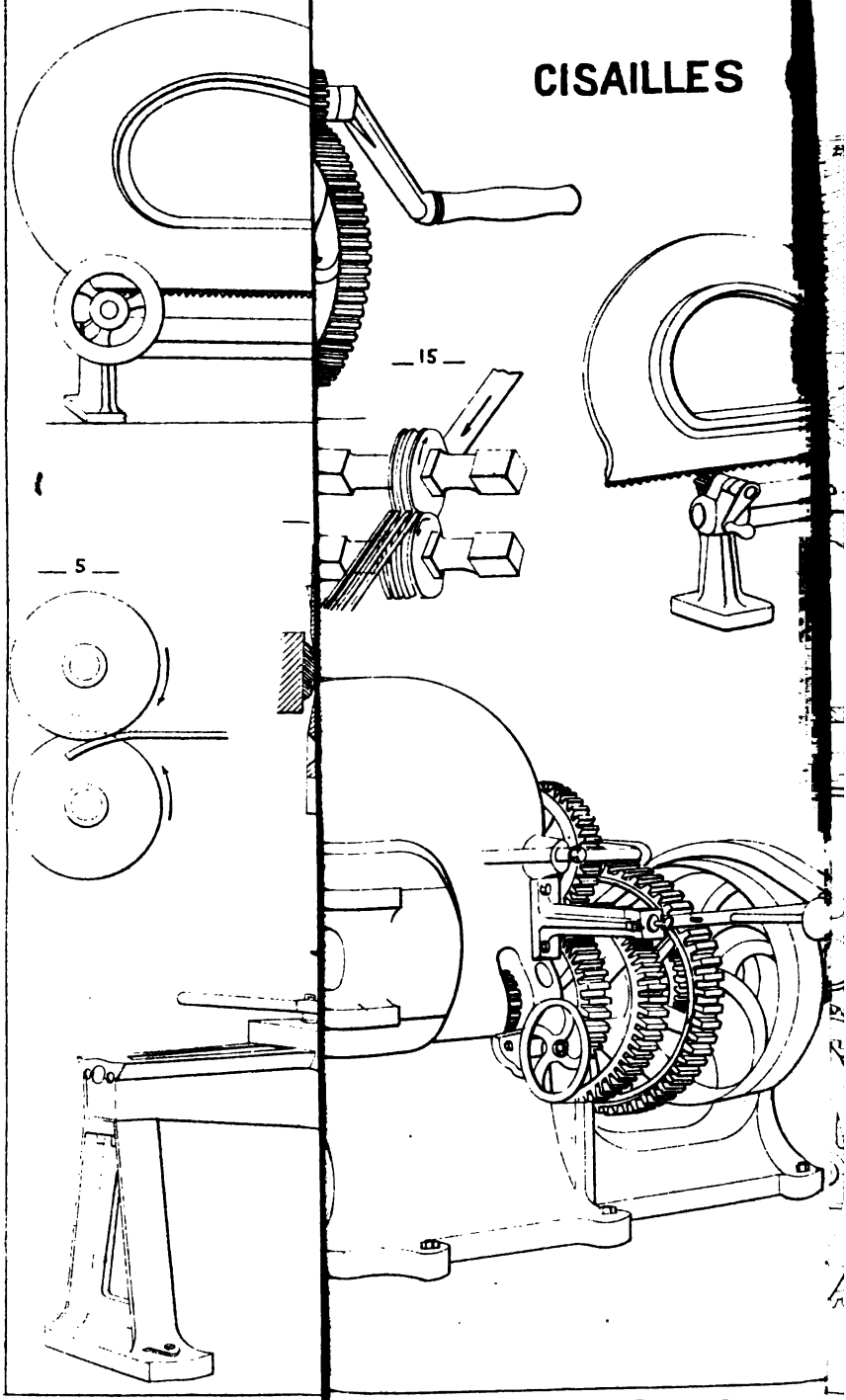
IMP. CHAIX - PARIS -

Digitized by Google

Digitized by Google

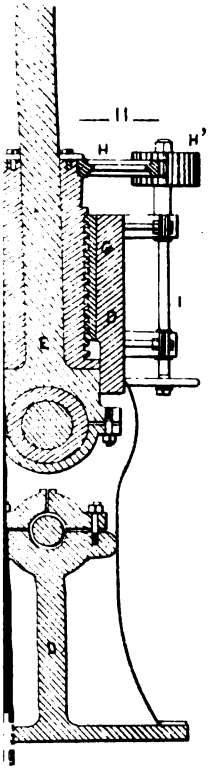
Digitized by Google

CISAILLES

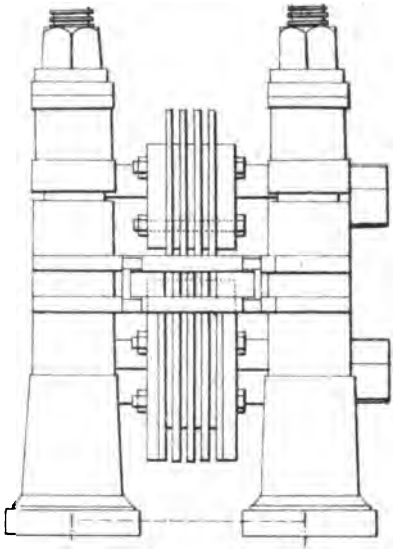


Juillet 1896

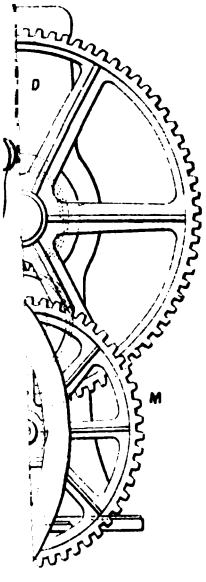
Digitized by Google

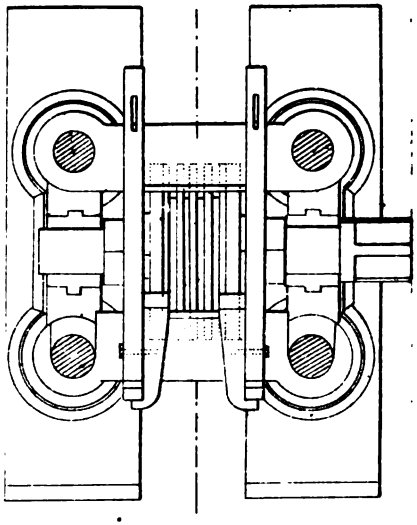


—11—



—13—



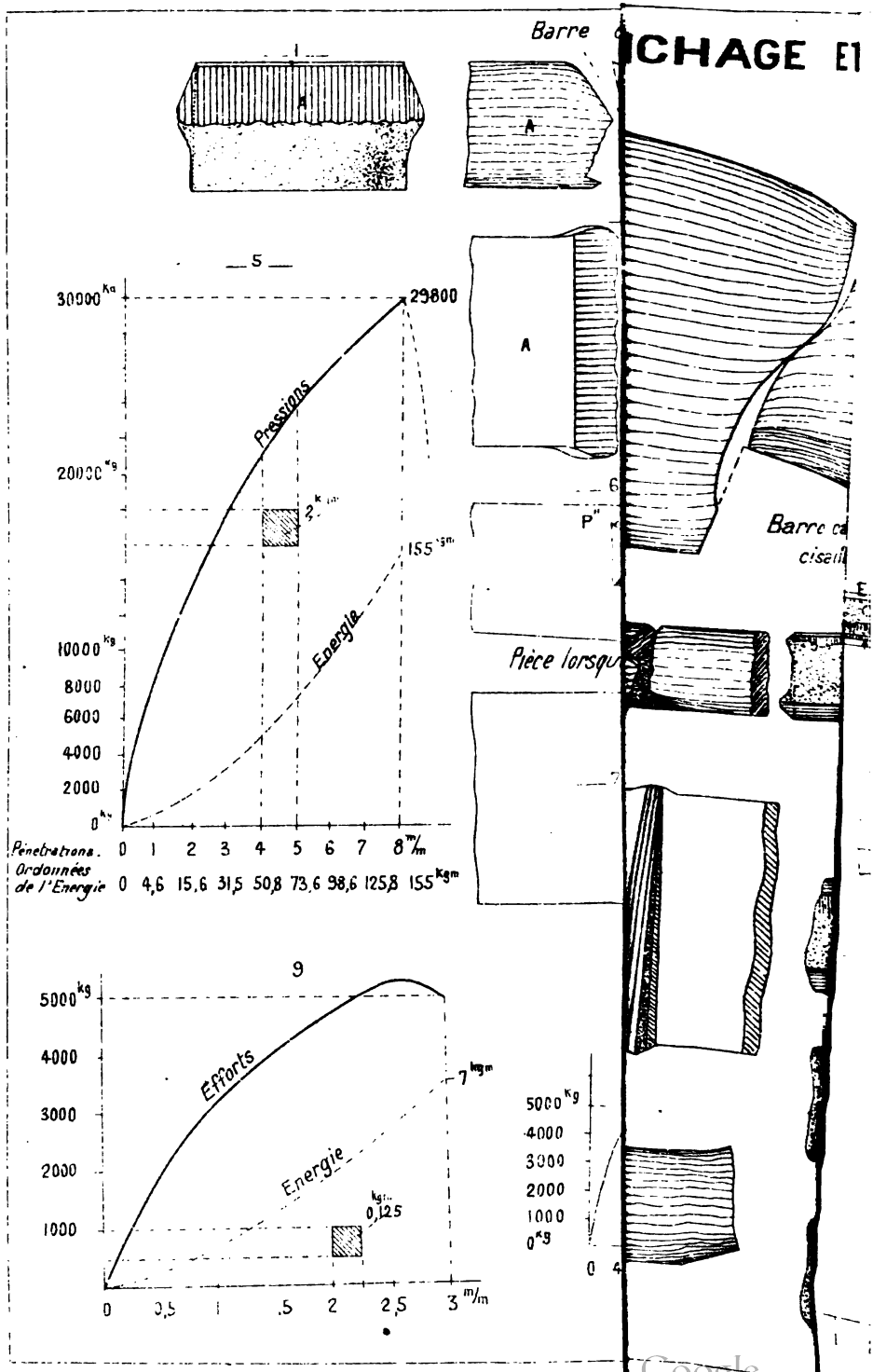


—14—

Digitized by Google

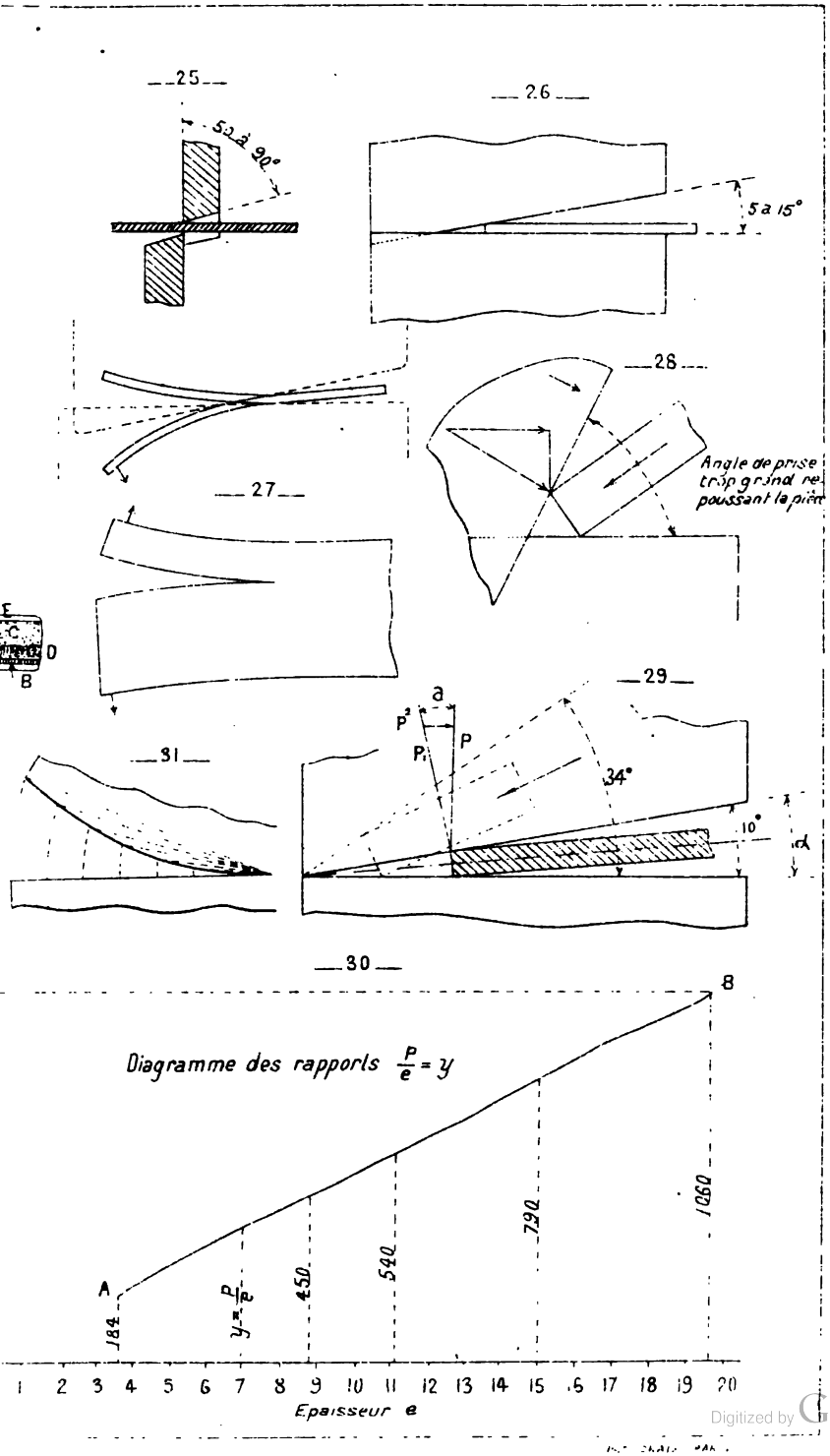
Digitized by Google

Digitized by Google



Juillet 1896

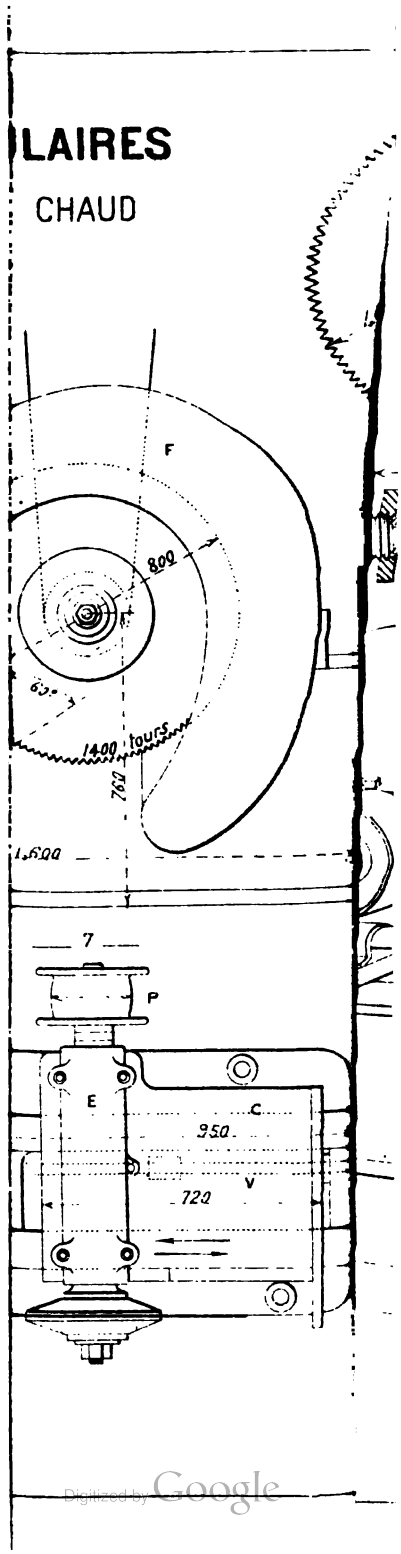
Digitized by Google



Digitized by Google

Digitized by Google

Digitized by Google



Digitized by Google

Pièces moletées

— 17 —

— 18 —

F

— 15 —

40

E

40

G

— 13 —

Pièces taillées

— 11 —

— 12 —

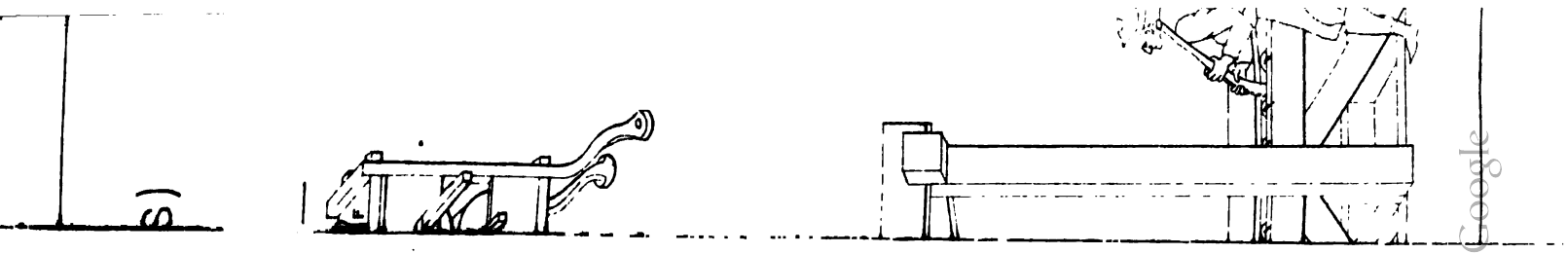
— 14 —

Digitized by Google

IMP. CHAIX - PARIS

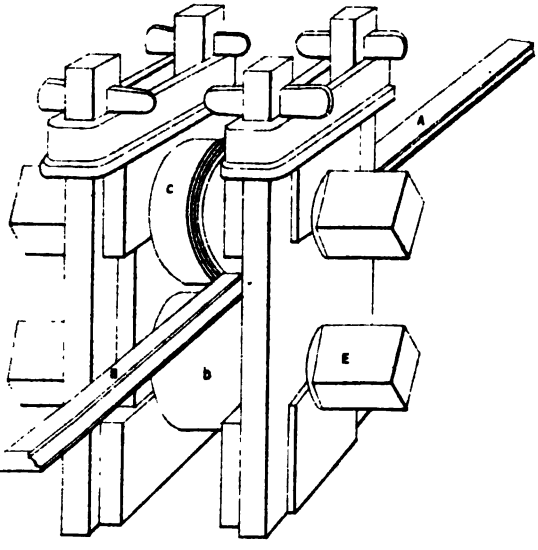
Digitized by Google

Digitized by Google

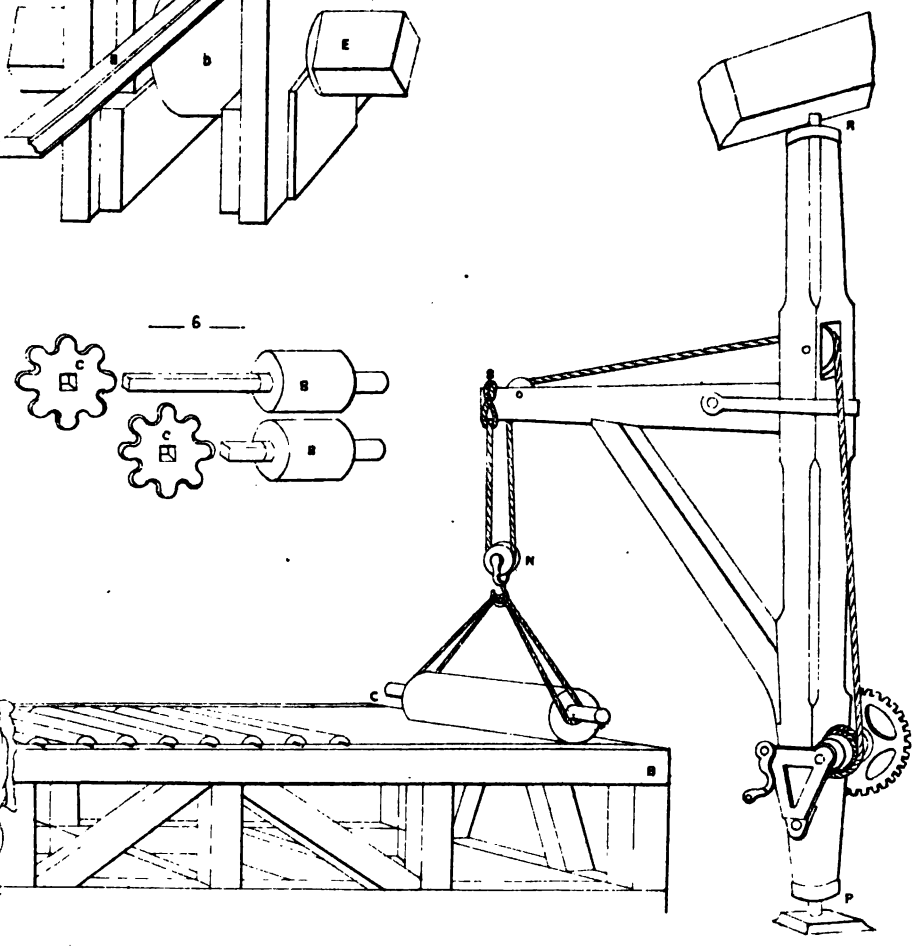


Digitized by Google

— 5 —



— 6 —

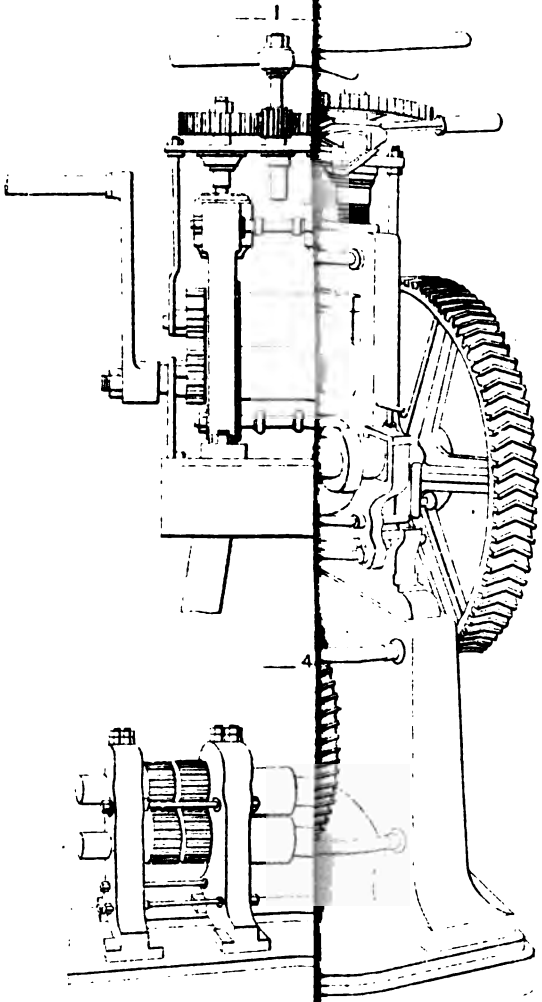


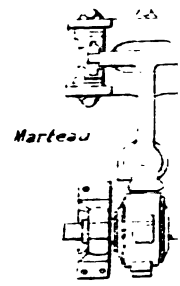
IMP. CHAIX - PARIS

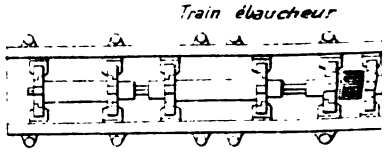
Digitized by Google

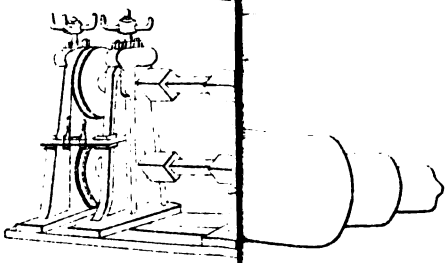
Digitized by Google

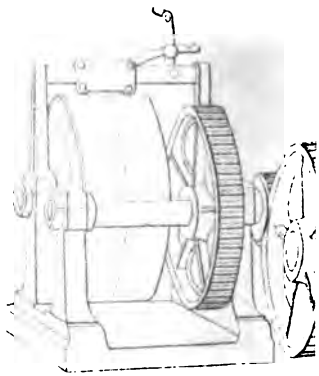
Digitized by Google











Digitized by Google

Août 1886

MIN

—7—

—8—

Laminoir Universel

—9—

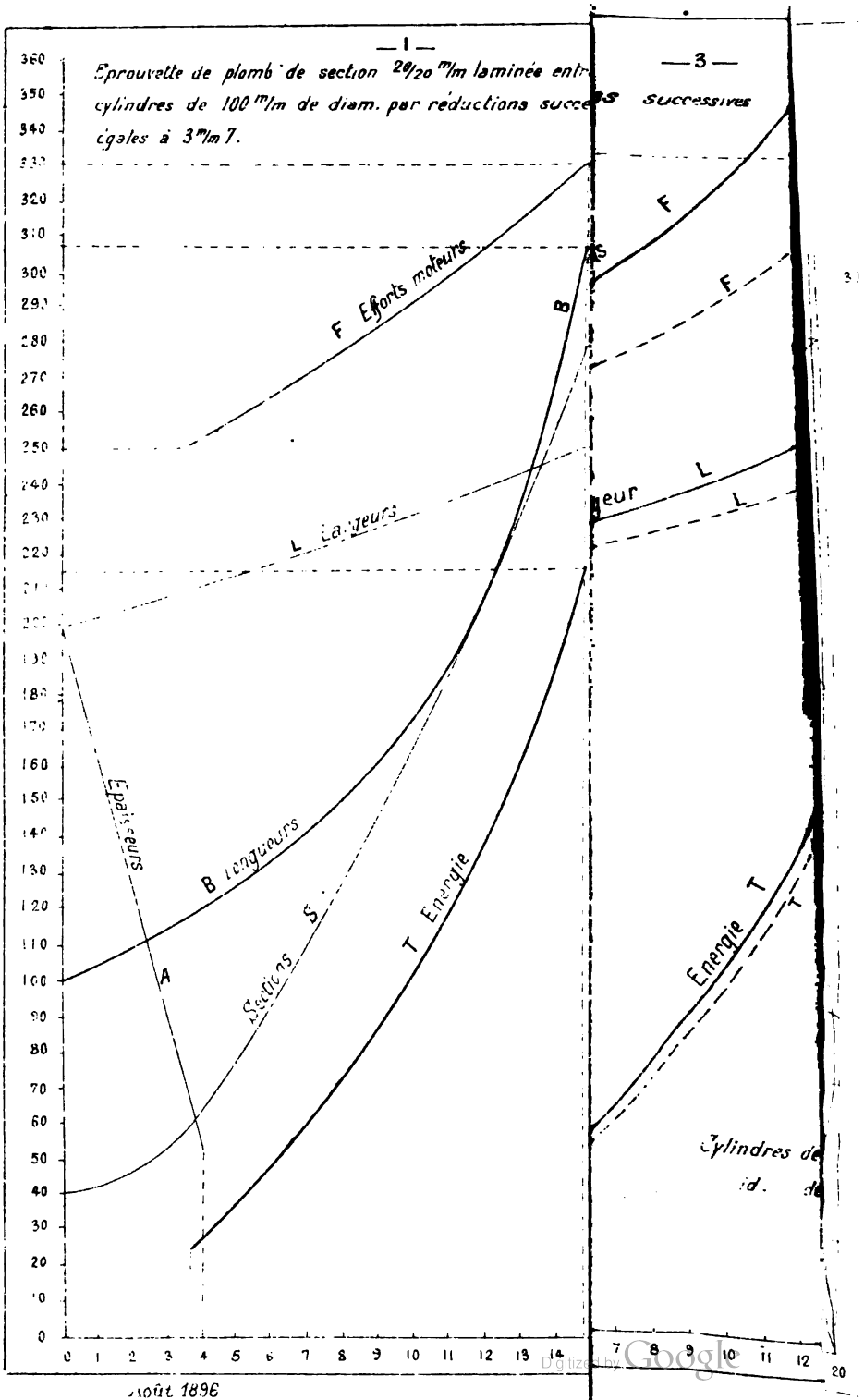
Modèle de Witkowitz

Digitized by Google

IMP CHAIX - PARIS

Digitized by Google

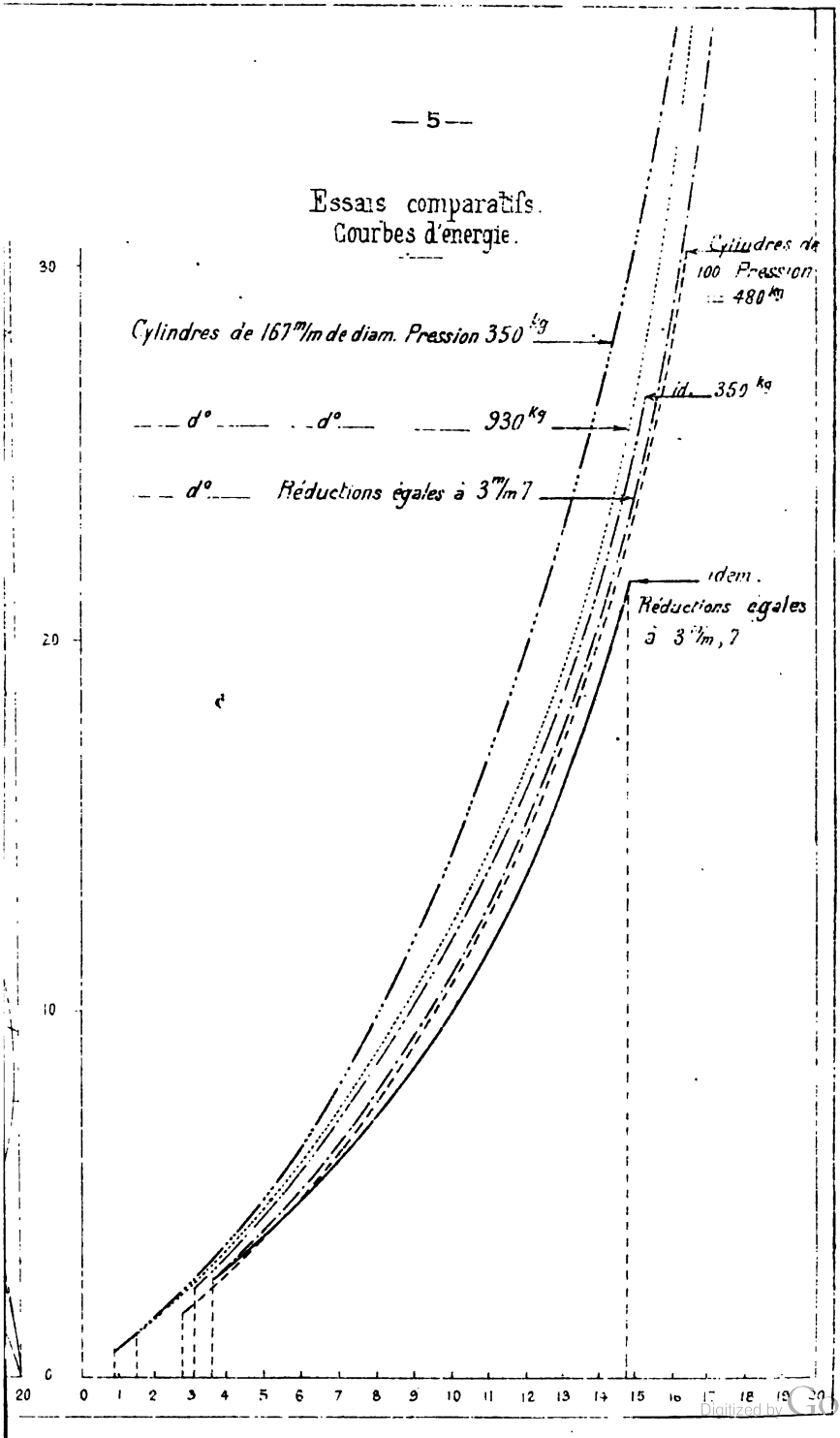
Digitized by Google



Digitized by Google

— 5 —

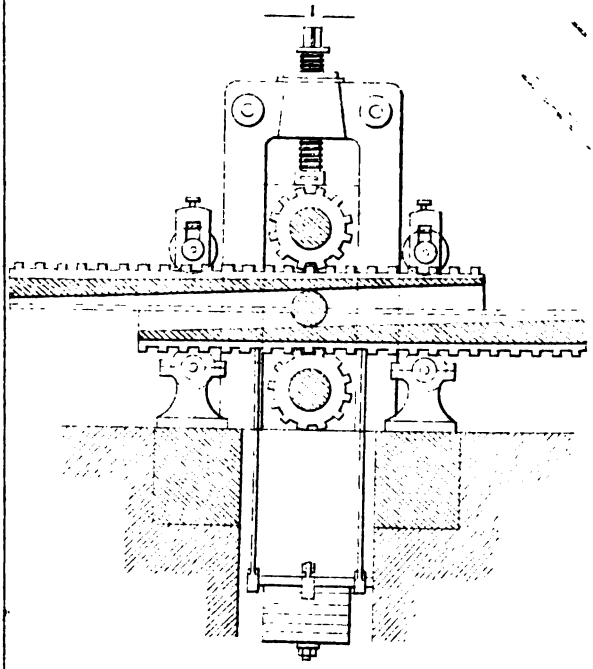
Essais comparatifs.
Courbes d'énergie.

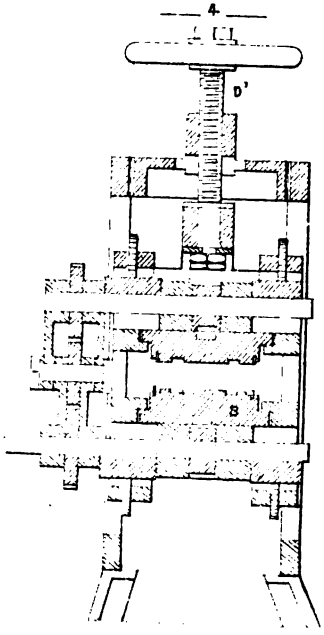


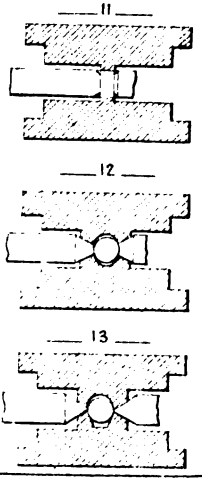
Digitized by Google

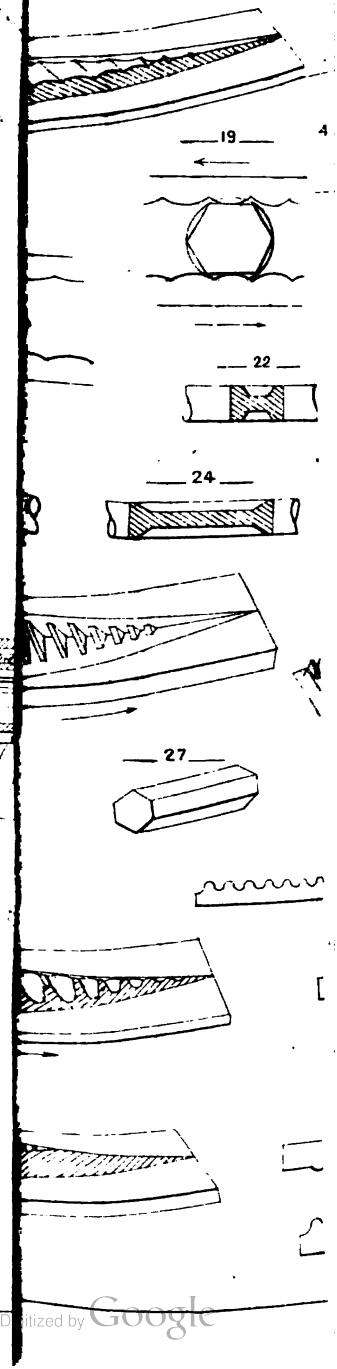
Digitized by Google

Digitized by Google



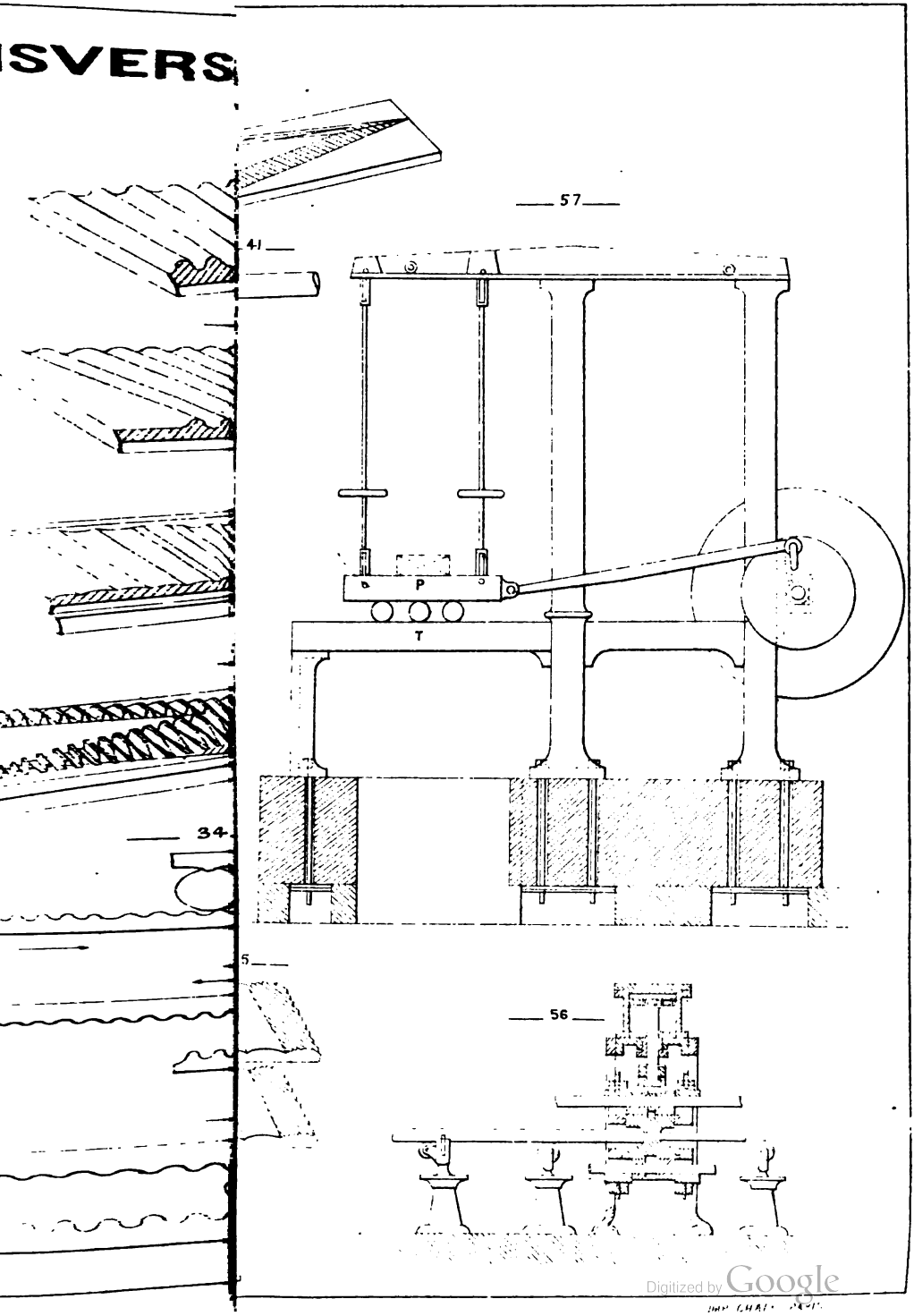






(Septembre 1896)

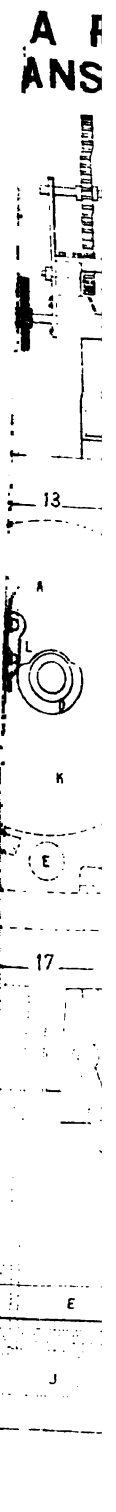
Digitized by Google



Digitized by Google

Digitized by Google

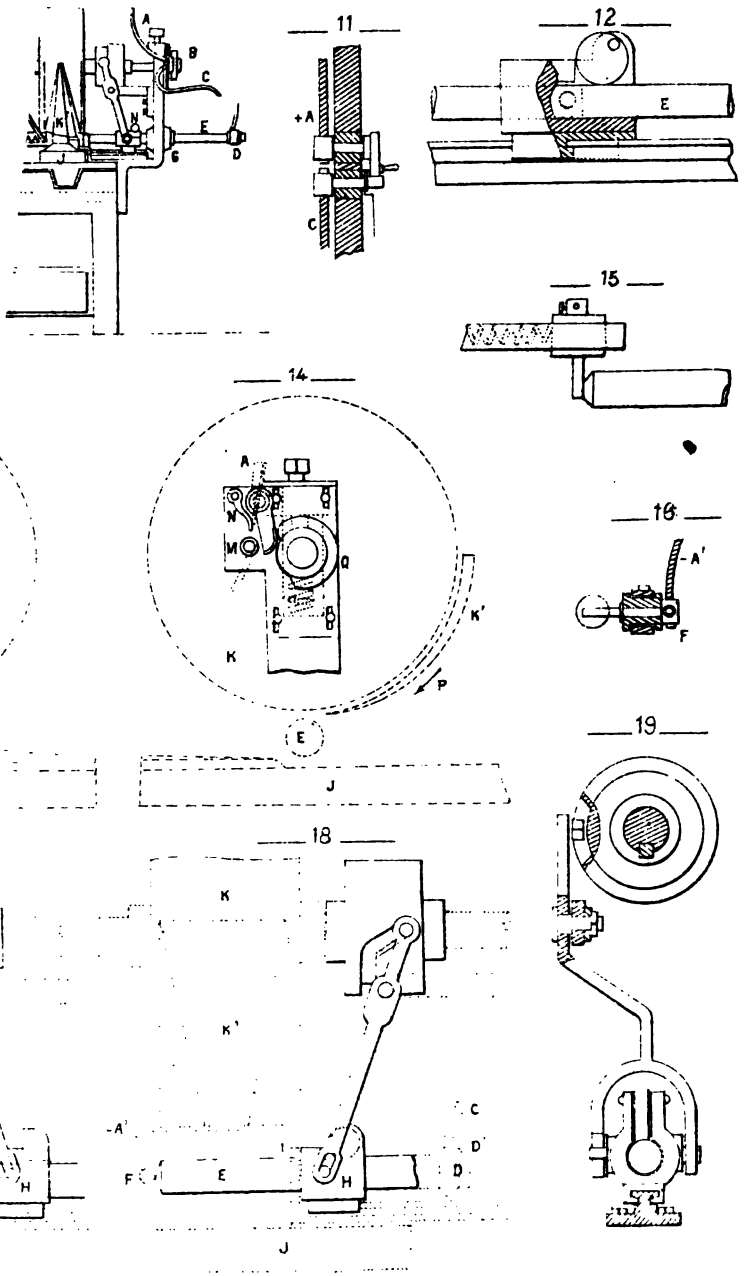
Digitized by Google



Digitized by Google

.R ET A LAMINER
;ALEMENT

Modèle Burton



Digitized by Google

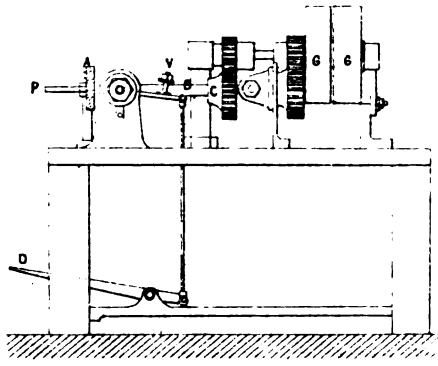
IMP. CHAIX - PARIS

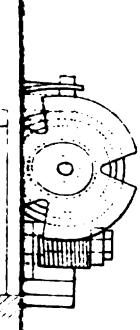
Digitized by Google

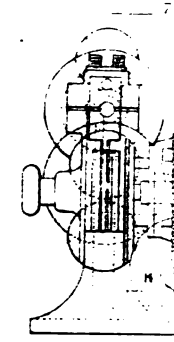
Digitized by Google

Modèle Dorm

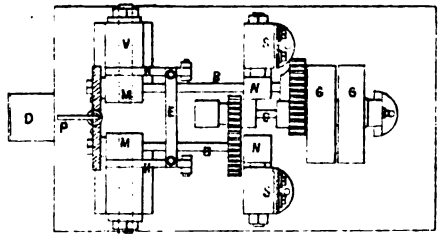
1

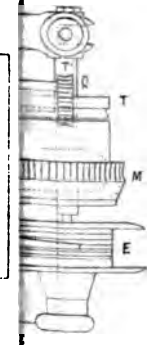




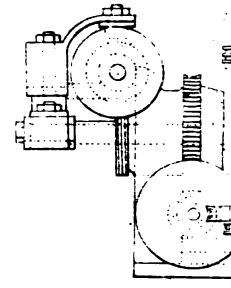


2

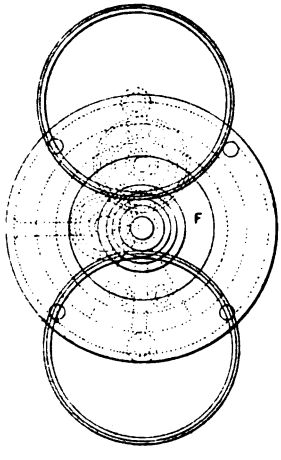


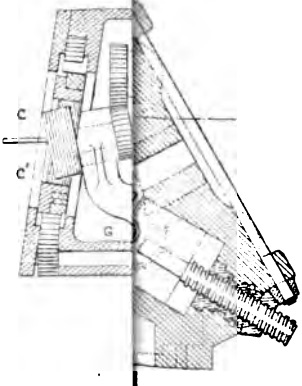


8

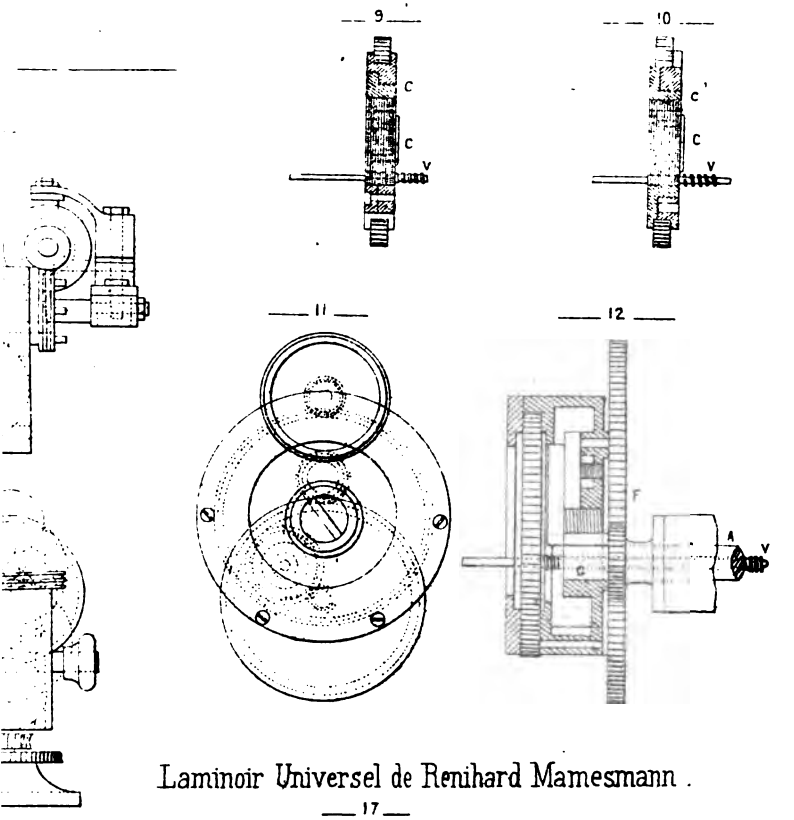


16

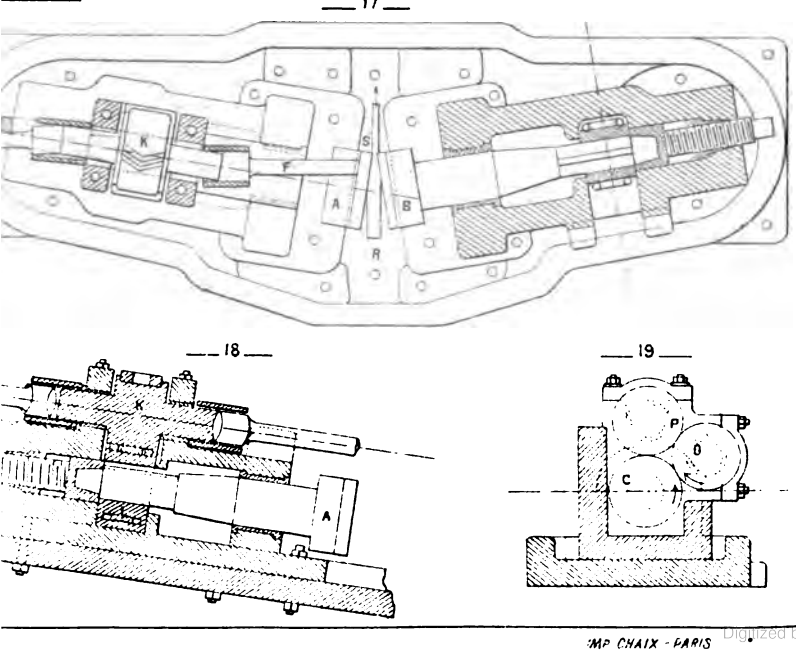




Digitized by Google



Laminoir Universel de Reinhard Mannesmann .



IMP. CHAIX - PARIS

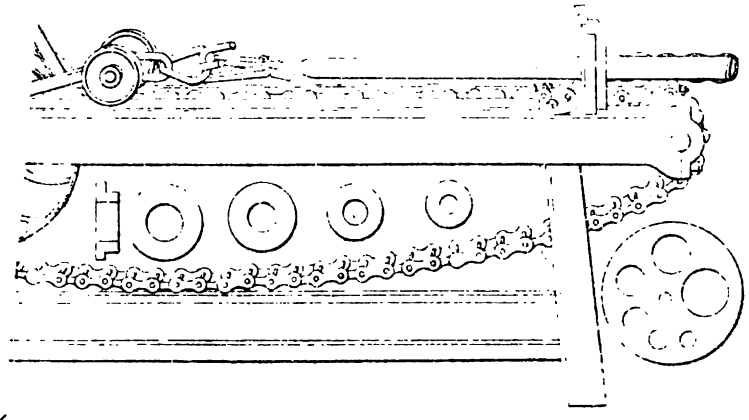
Digitized by Google

Digitized by Google

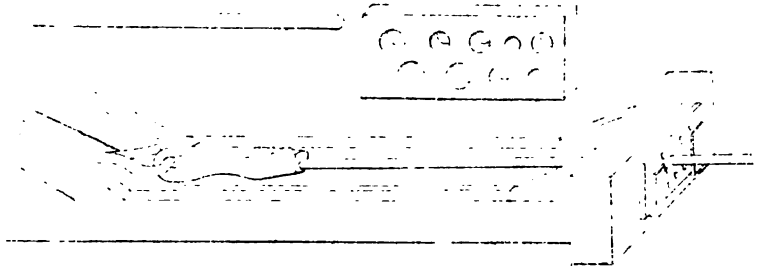
Digitized by Google

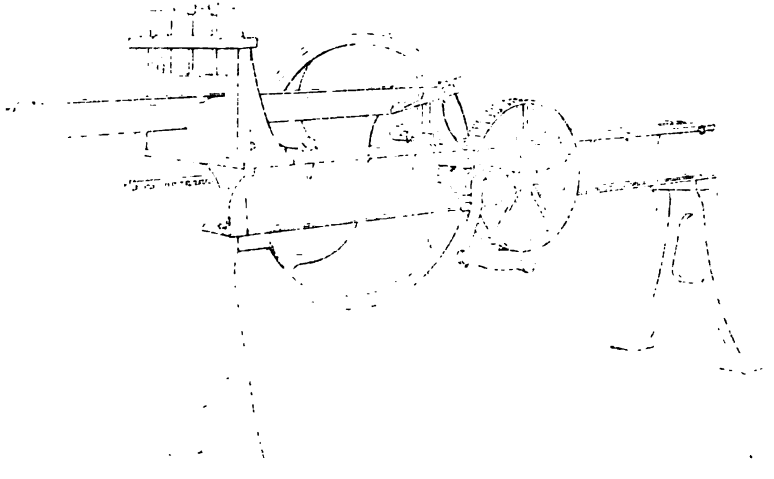
Digitized by Google

7



6

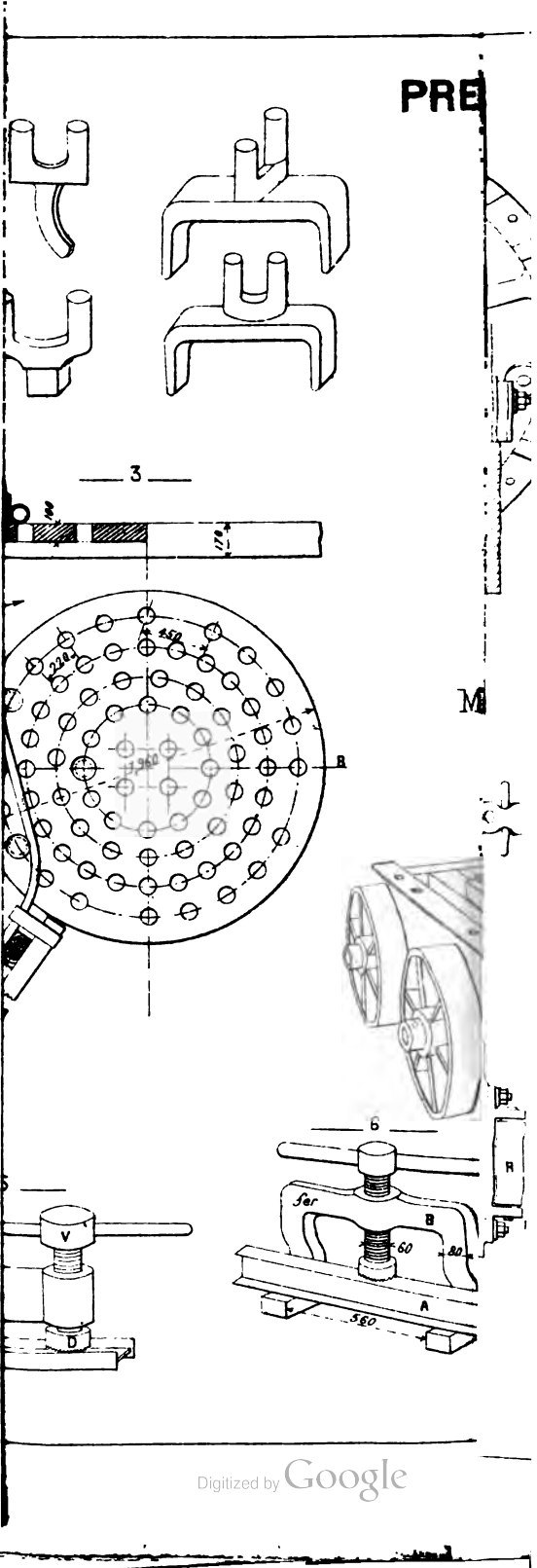




Digitized by Google

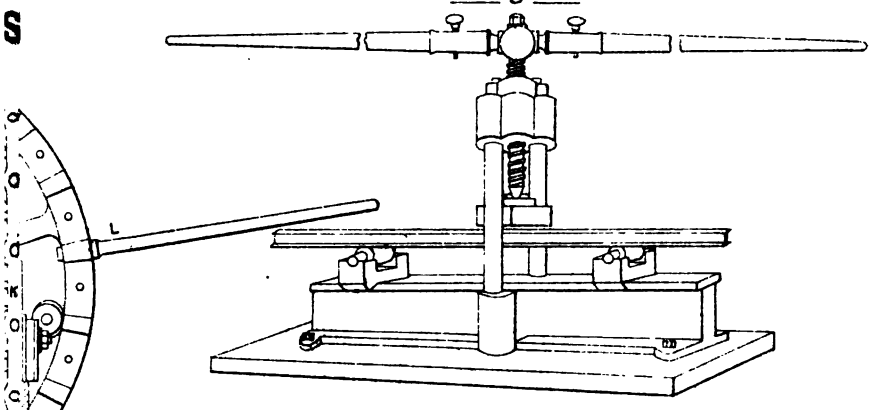
Digitized by Google

Digitized by Google

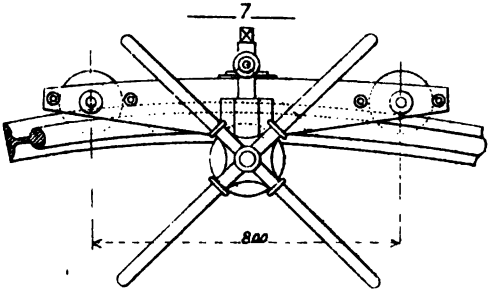


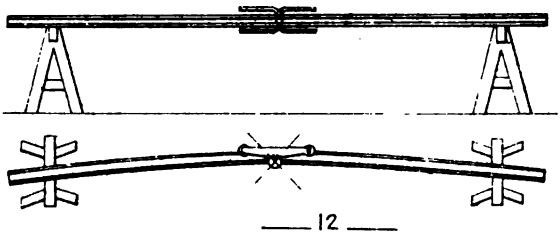
Digitized by Google

8



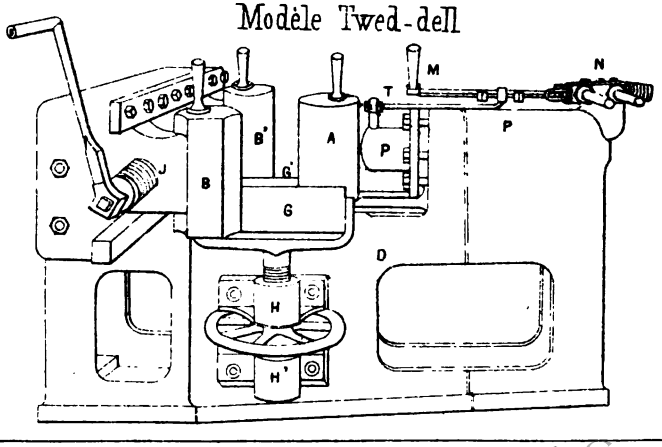
7





12

Modèle Twed-dell



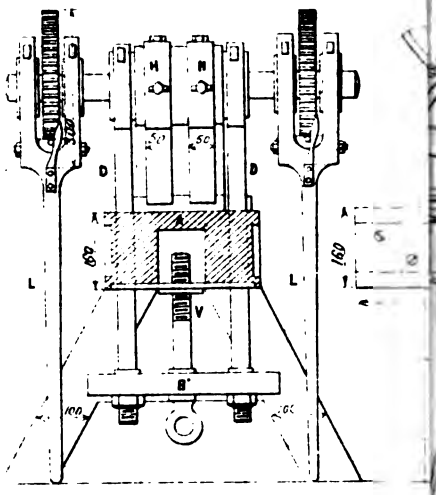
IMP. HAIX - Paris
Digitized by Google

Digitized by Google

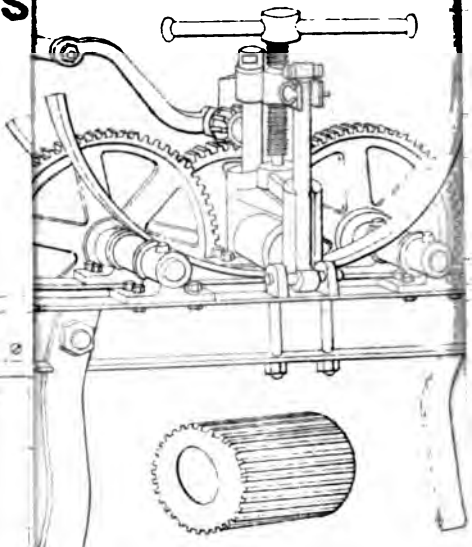
Digitized by Google

MACHINES

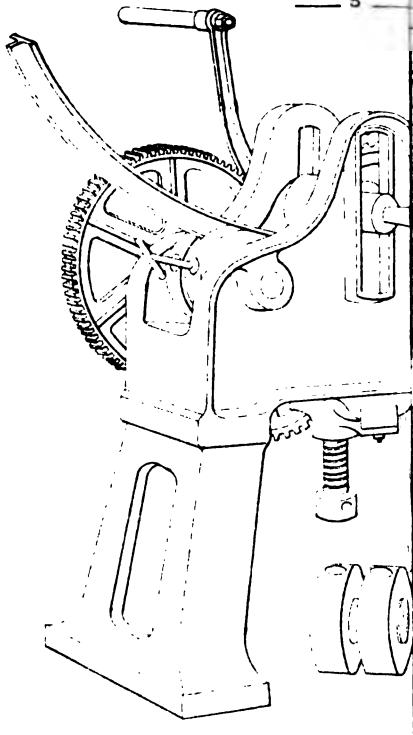
— 1 —



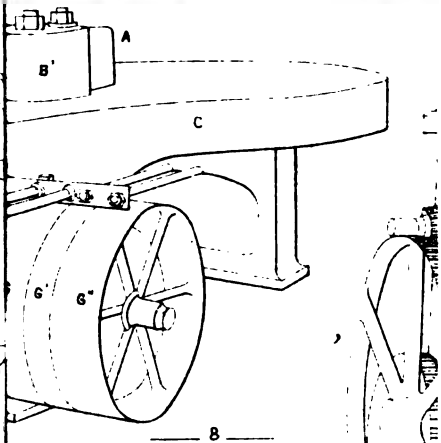
— 3 —



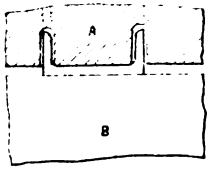
— 5 —



— 15 —

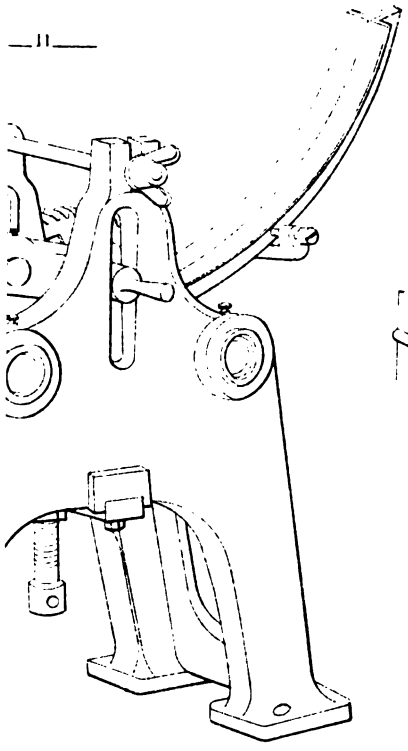


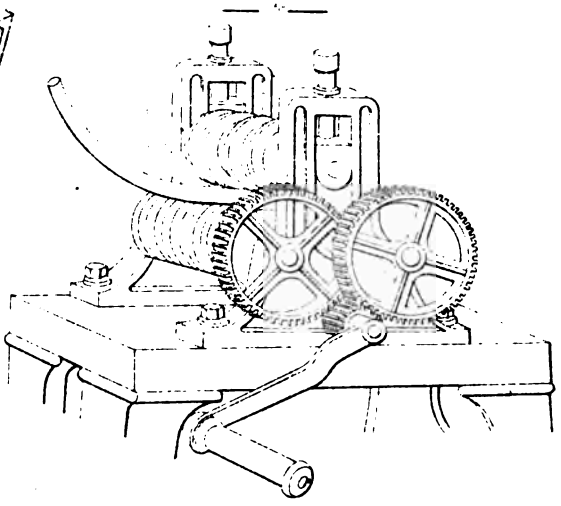
— 8 —

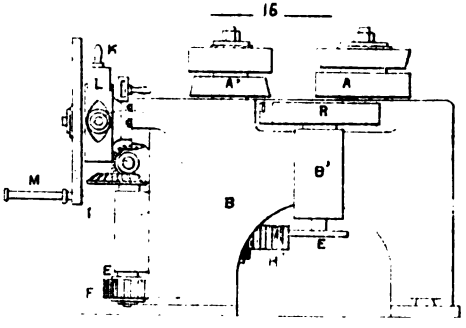


(November 18°8)

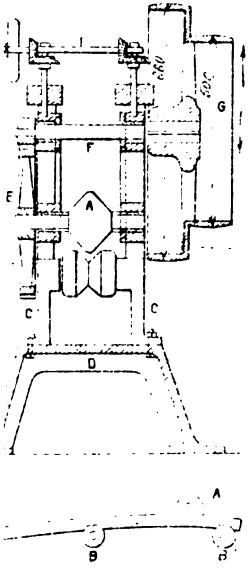
Digitized by Google

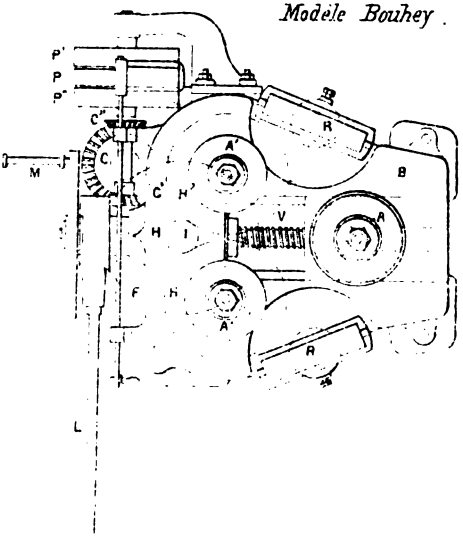






Modèle Bouhey.



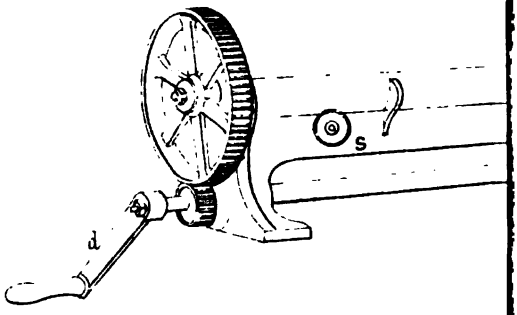


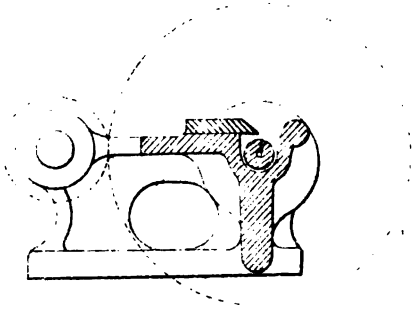
IMP. CHAIX - PARIS
Digitized by Google

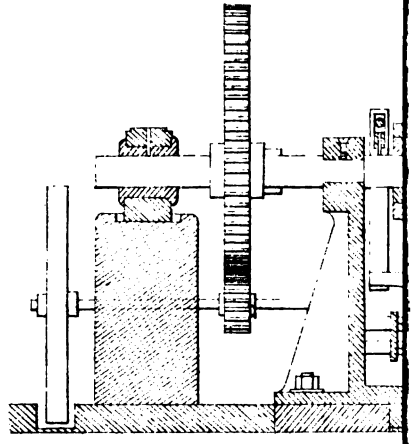
Digitized by Google

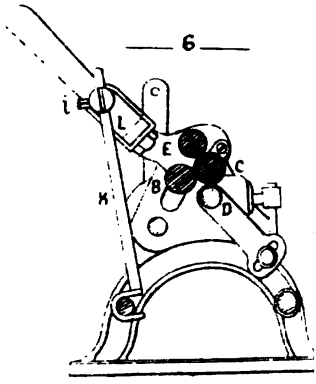
Digitized by Google

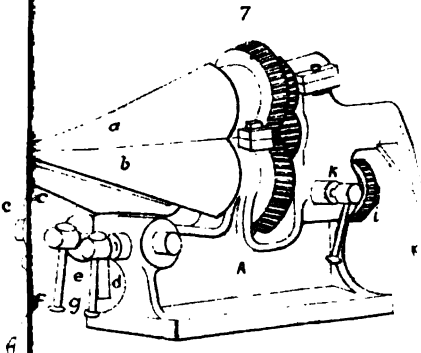
MACHINE

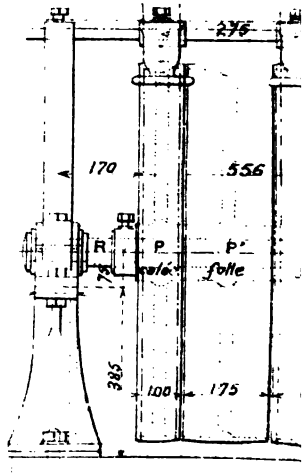






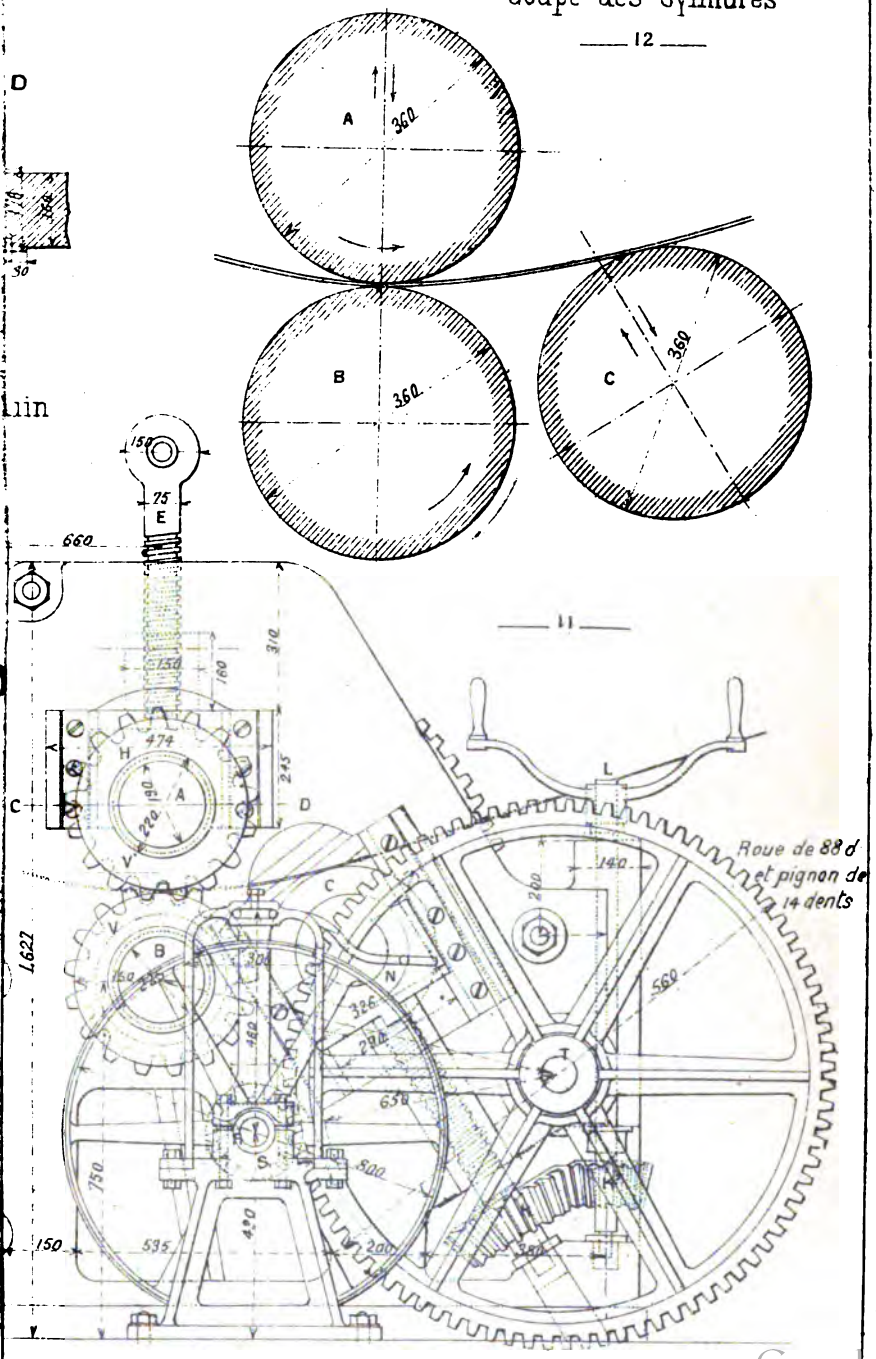






Digitized by Google

Coupe des Cylindres

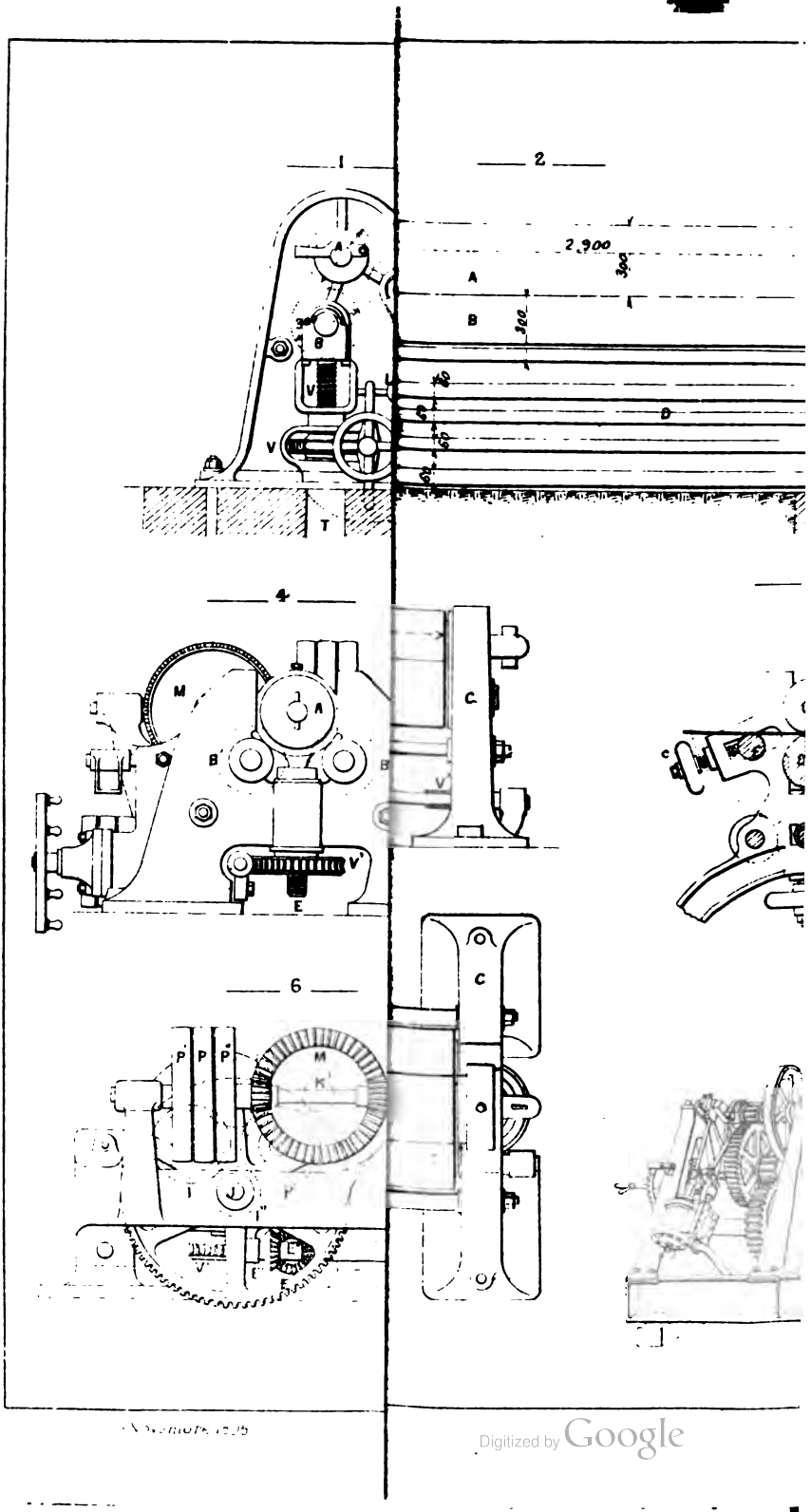


Digitized by Google

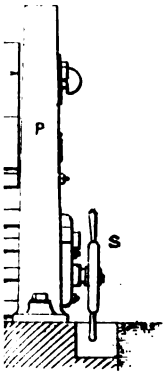
Imp. Chaix Paris.

Digitized by Google

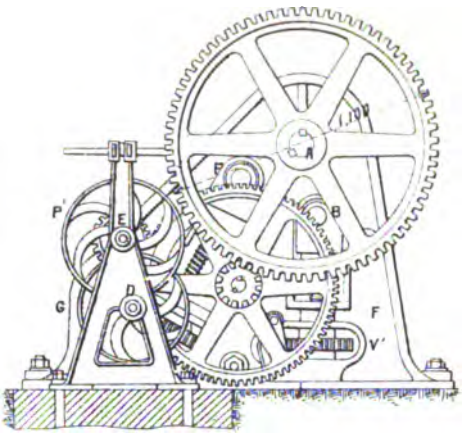
Digitized by Google

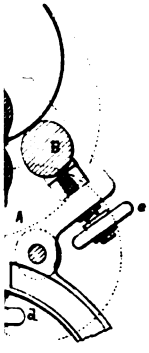


Digitized by Google

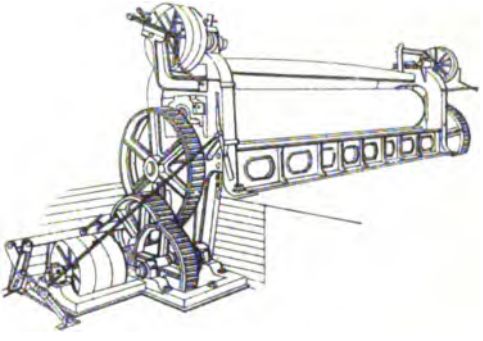


3

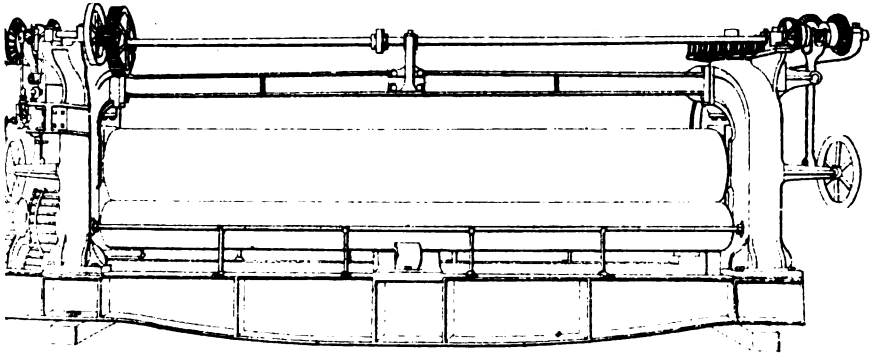




9



10

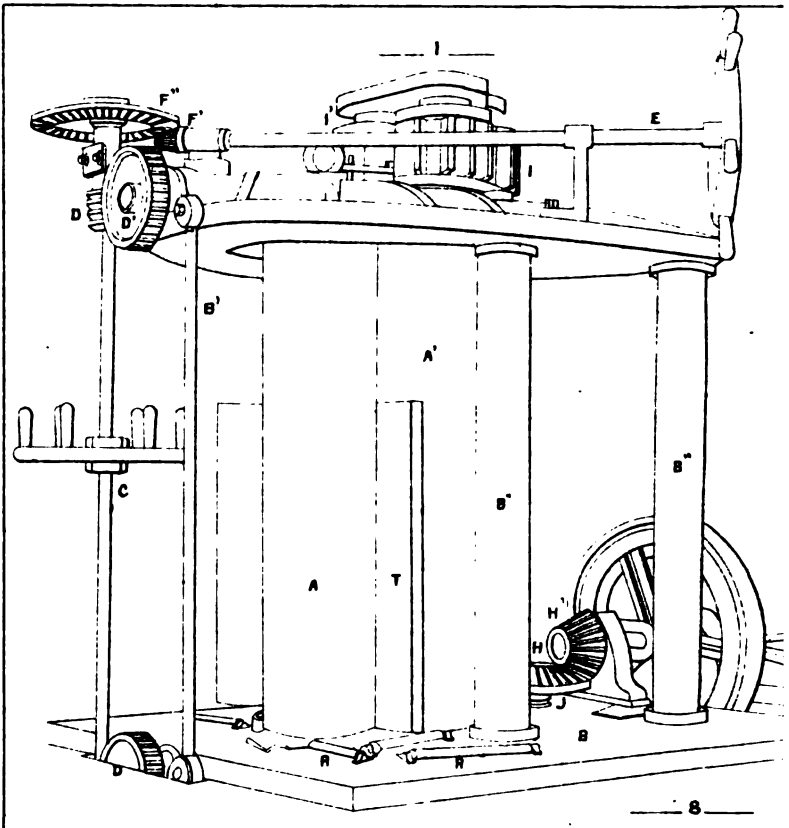


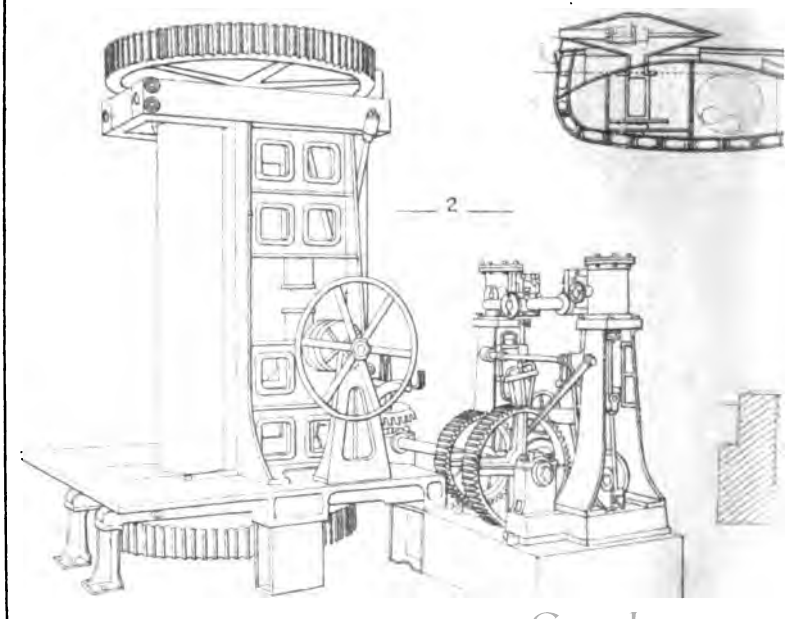
IMP. CHAIX - PARIS

Digitized by Google

Digitized by Google

Digitized by Google



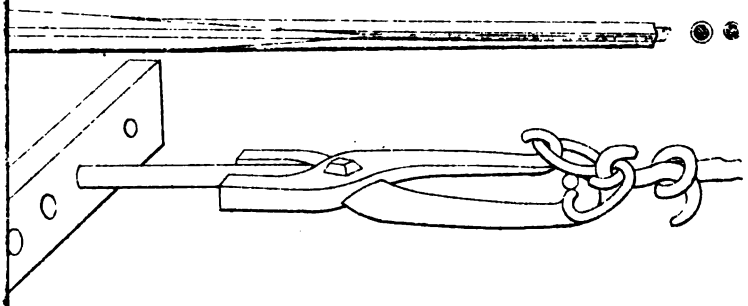


(Novembre 1896)

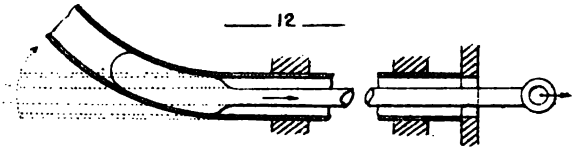
Digitized by Google

VERTICAL)

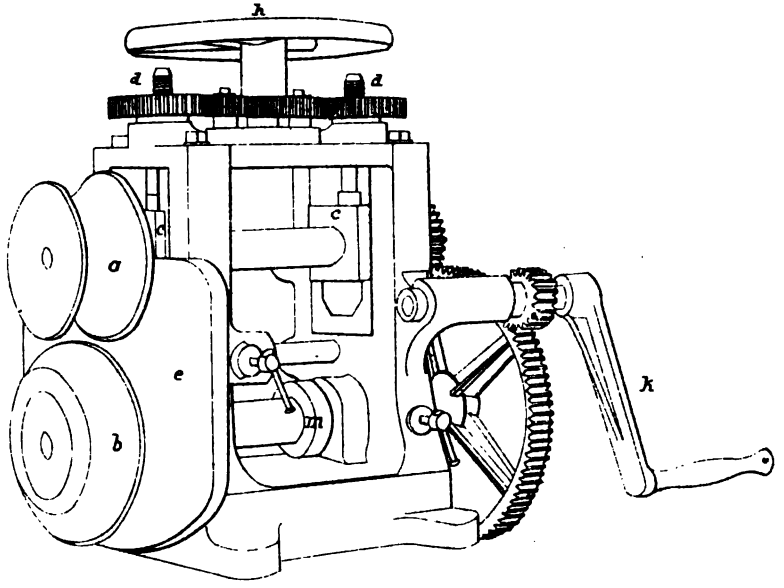
14



12



15

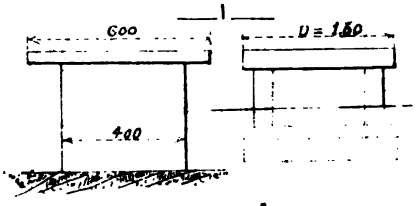


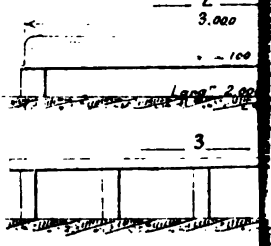
IMP CHAIX - PARIS

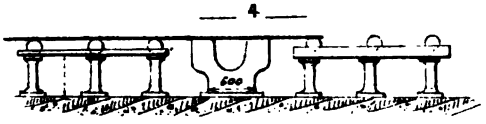
Digitized by Google

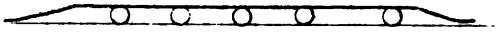
Digitized by Google

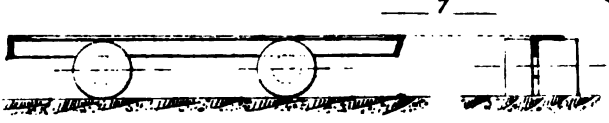
Digitized by Google

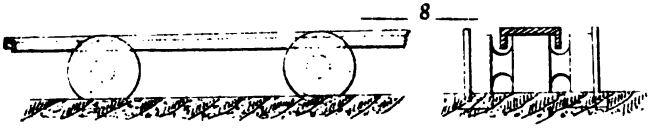


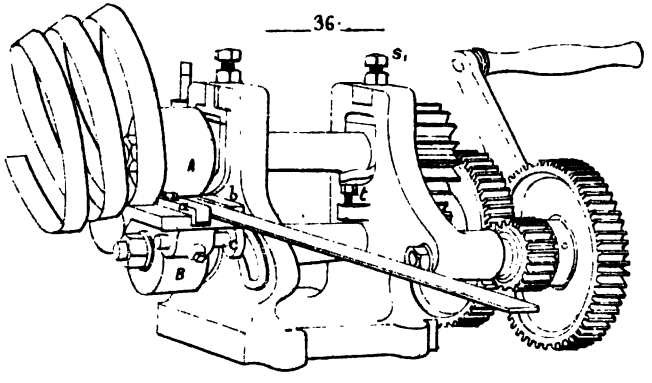


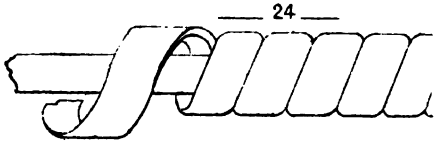


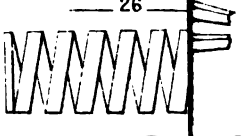








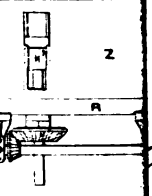


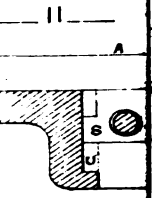


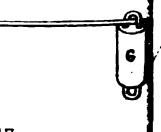
Digitized by Google

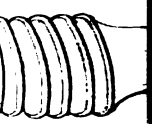
SSER

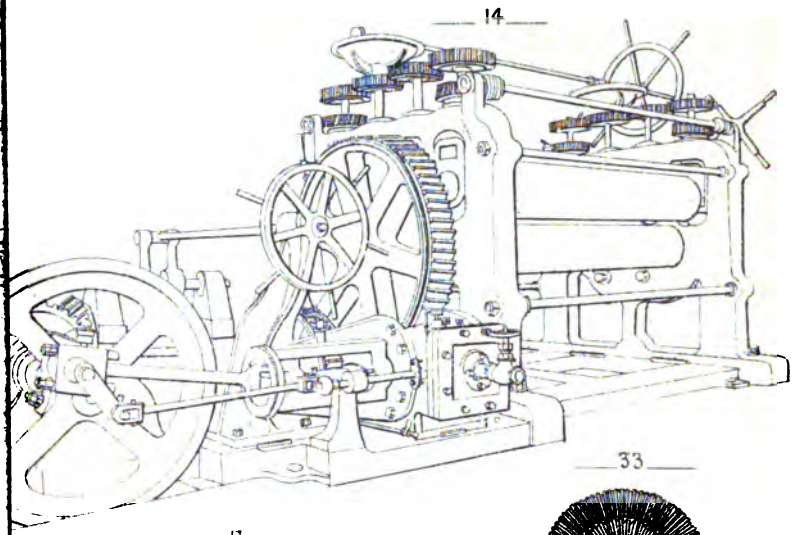
Mr Ziane

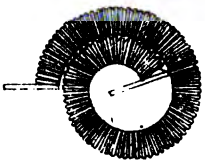


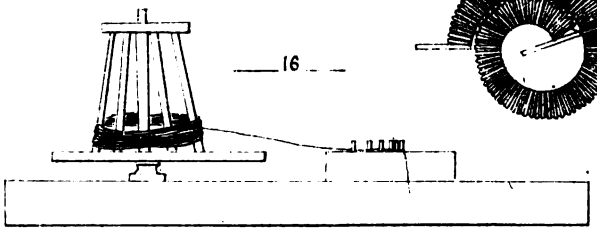


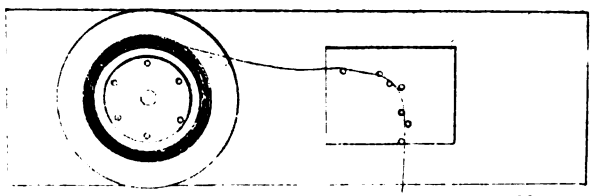


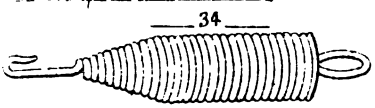


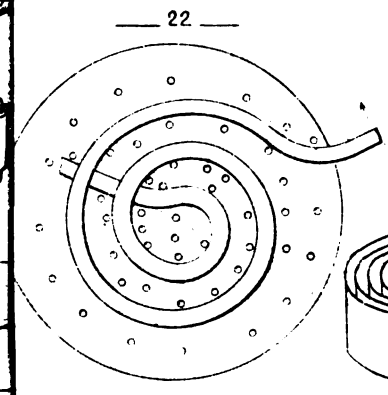


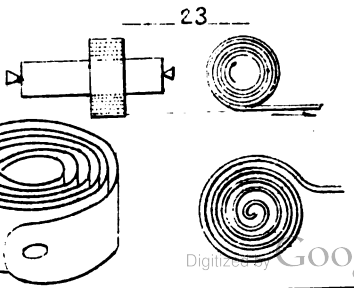










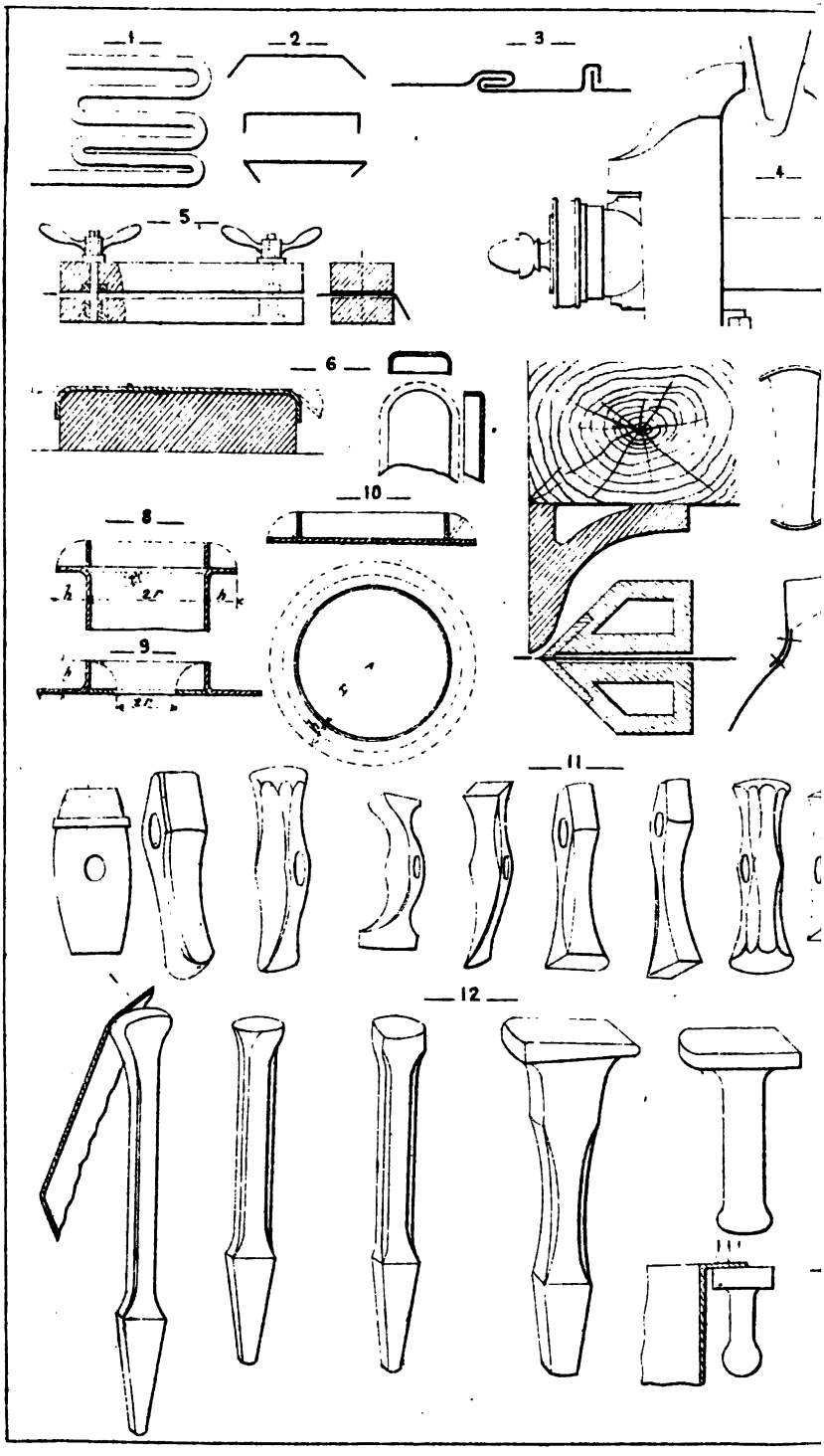


Digitized by Google

IMP. CHAIX - PARIS - 12/98 12-9

Digitized by Google

Digitized by Google

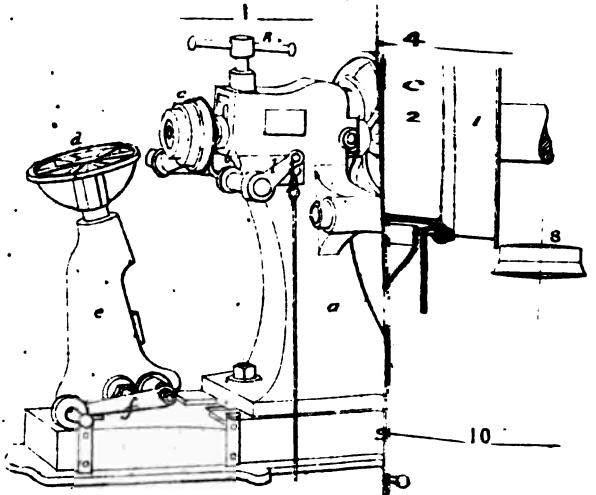


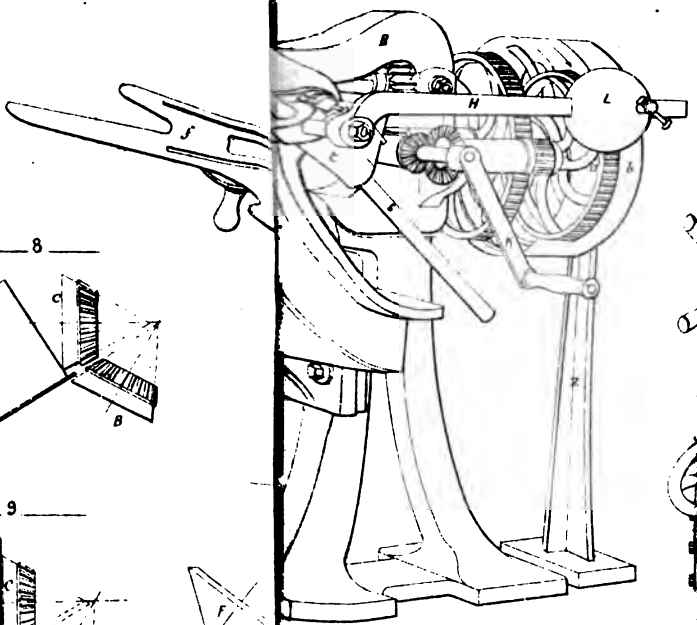
Digitized by Google

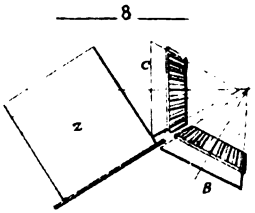
Digitized by Google

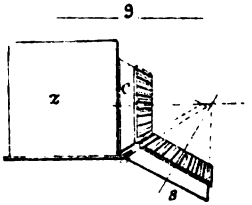
Digitized by Google

Digitized by Google

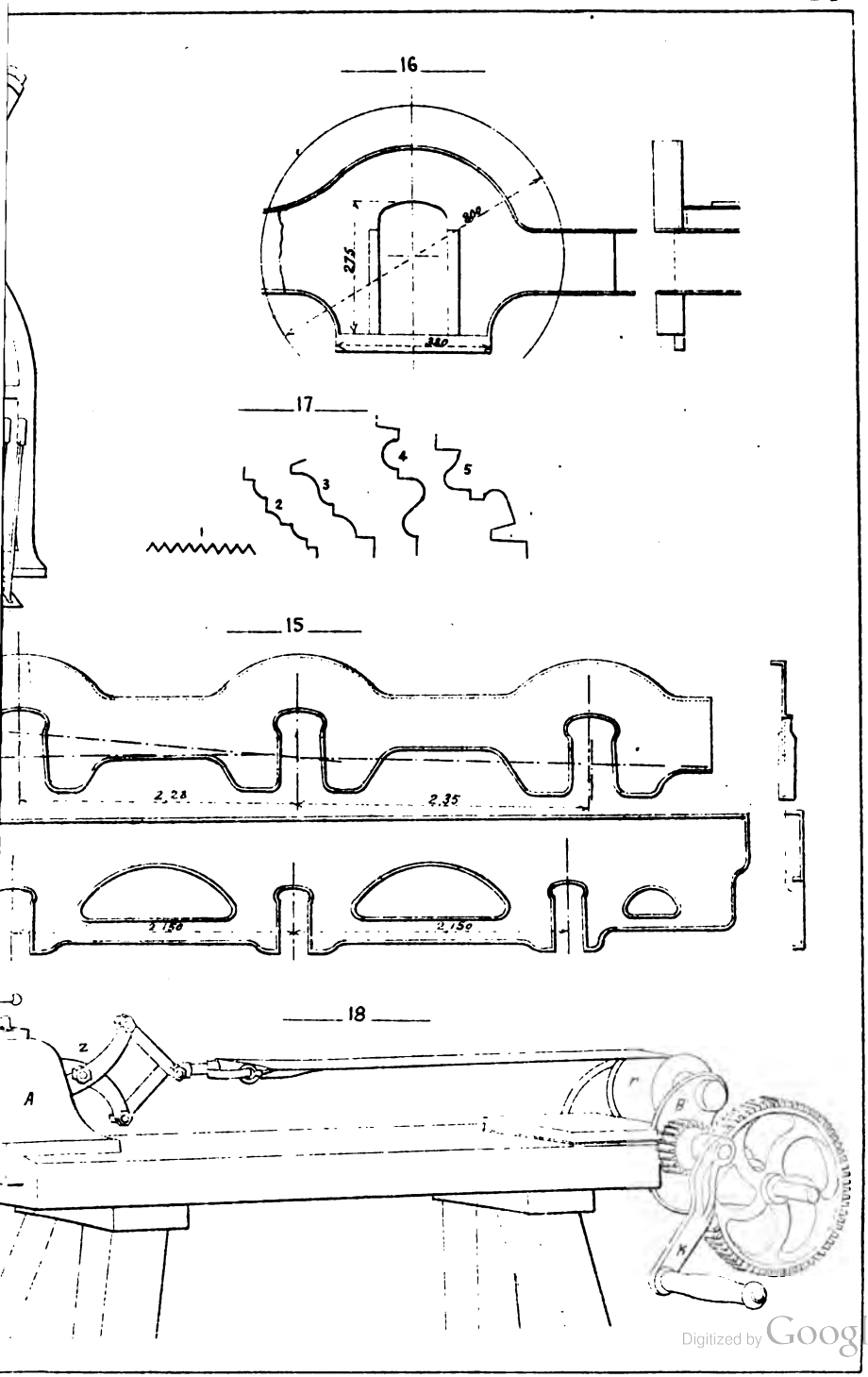








Digitized by Google

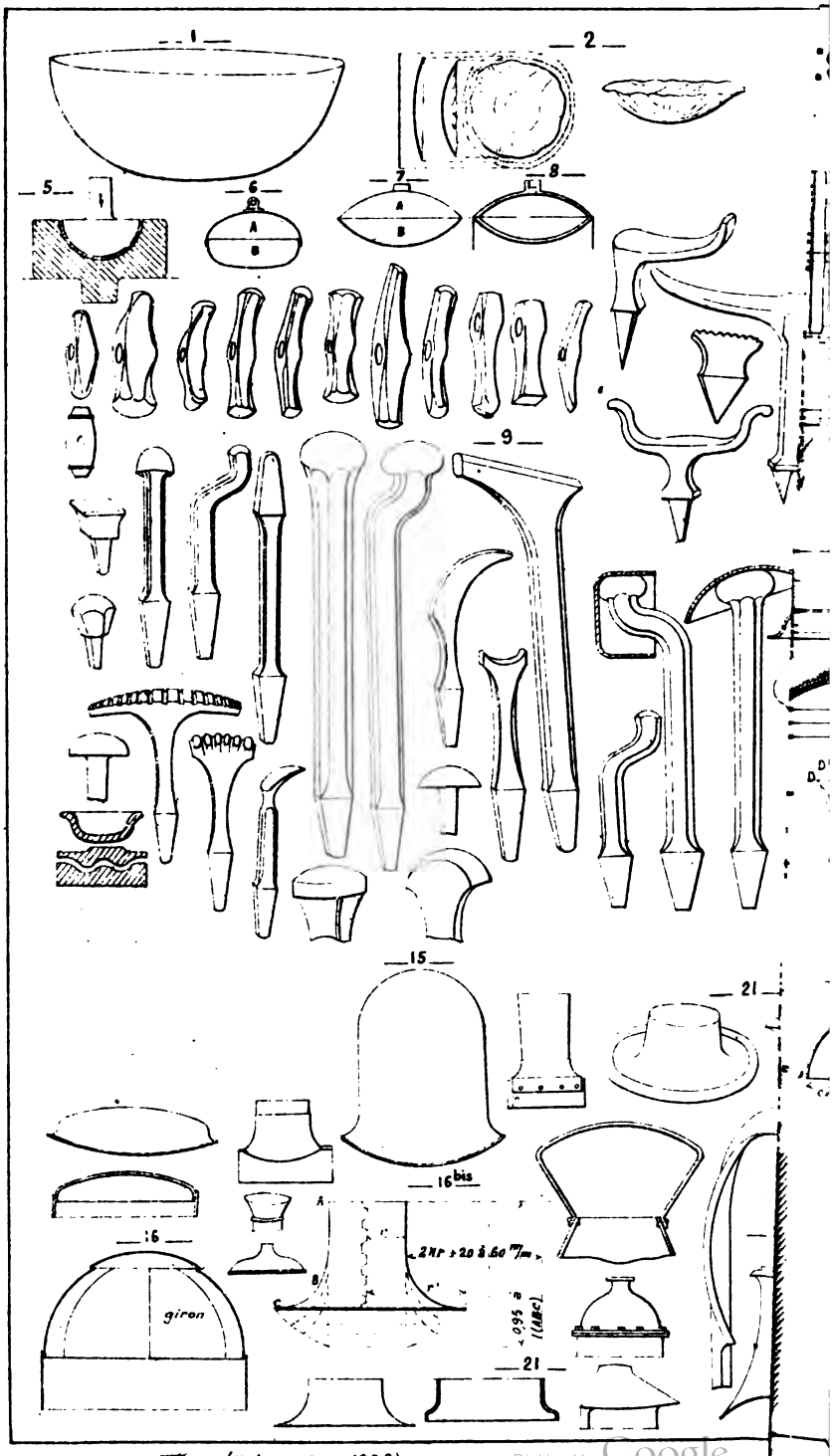


Digitized by Google

IMP. CHAIX - PARIS - 12790 - 12-96

Digitized by Google

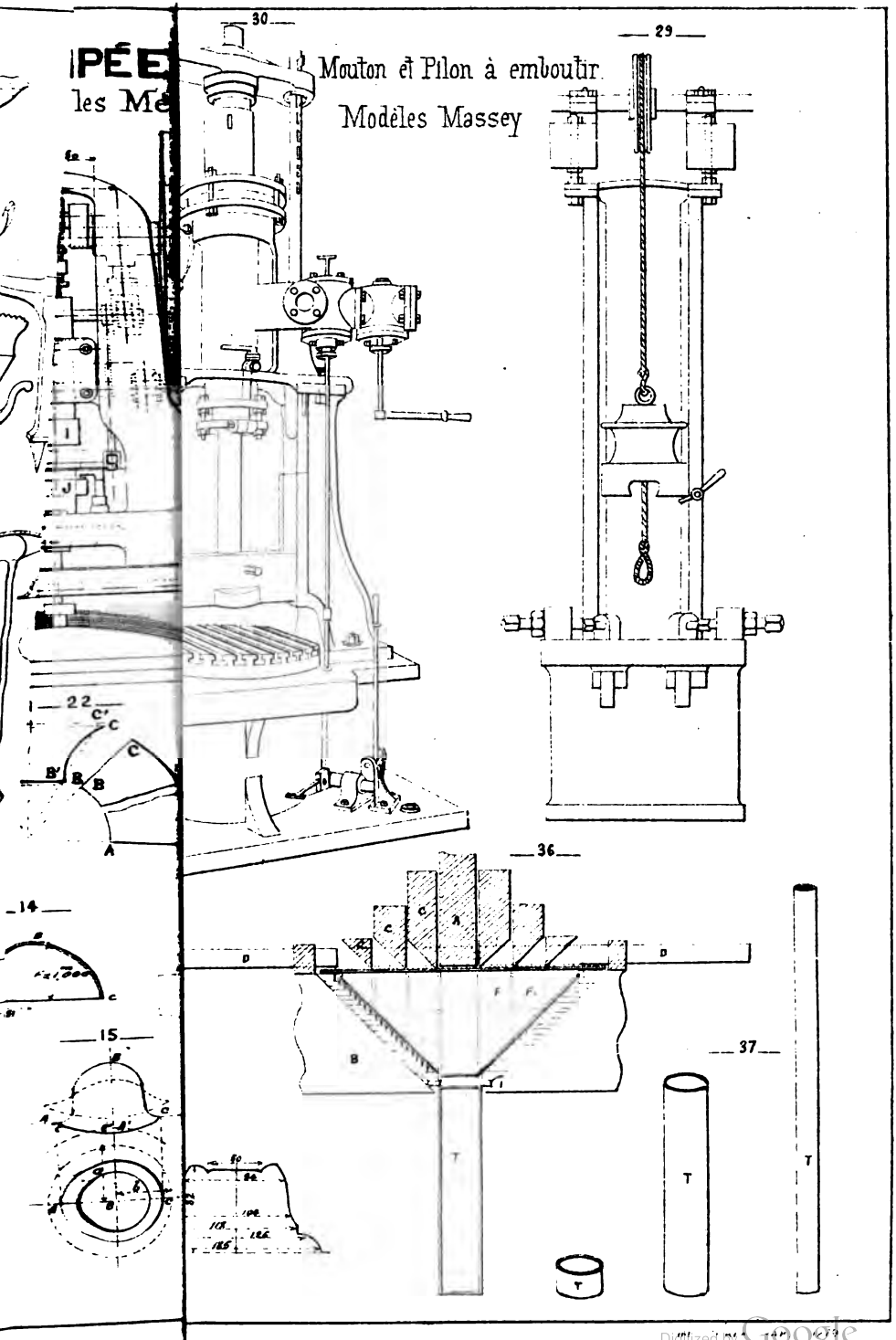
Digitized by Google



(Décembre 1896)

Digitized by Google

Mouton et Pilon à emboutir
Modèles Massey

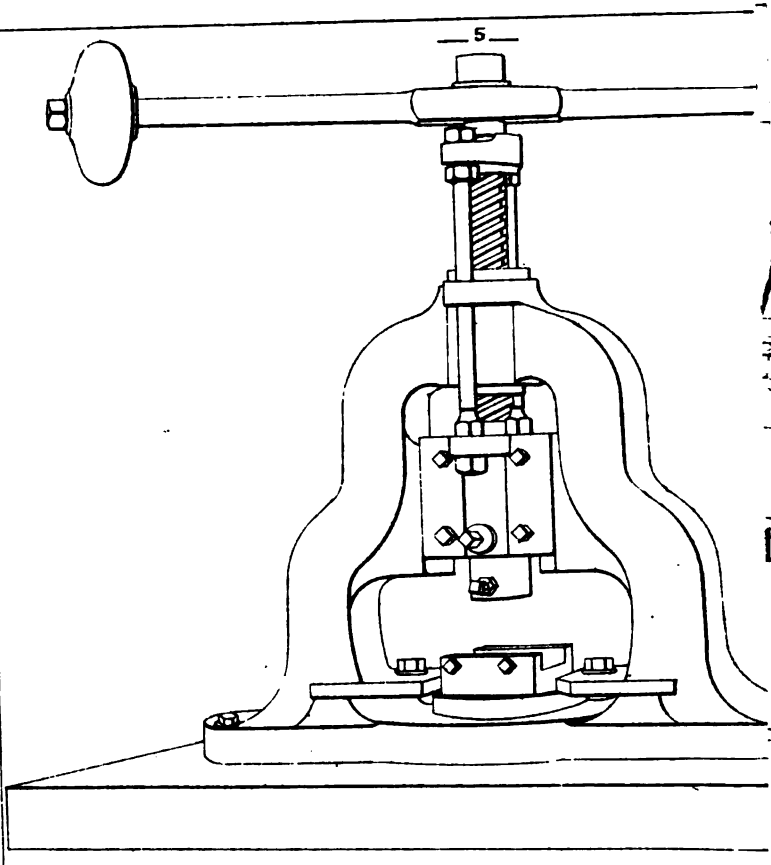


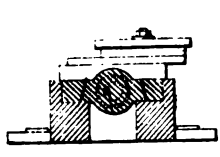
Digitized by Google

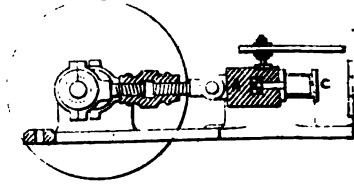
Digitized by Google

Digitized by Google

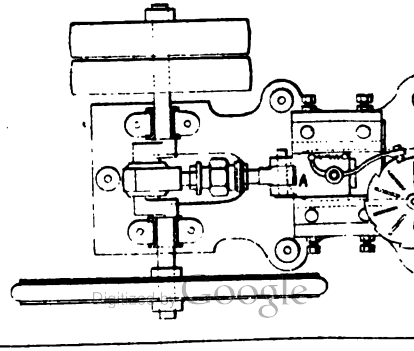
—5—



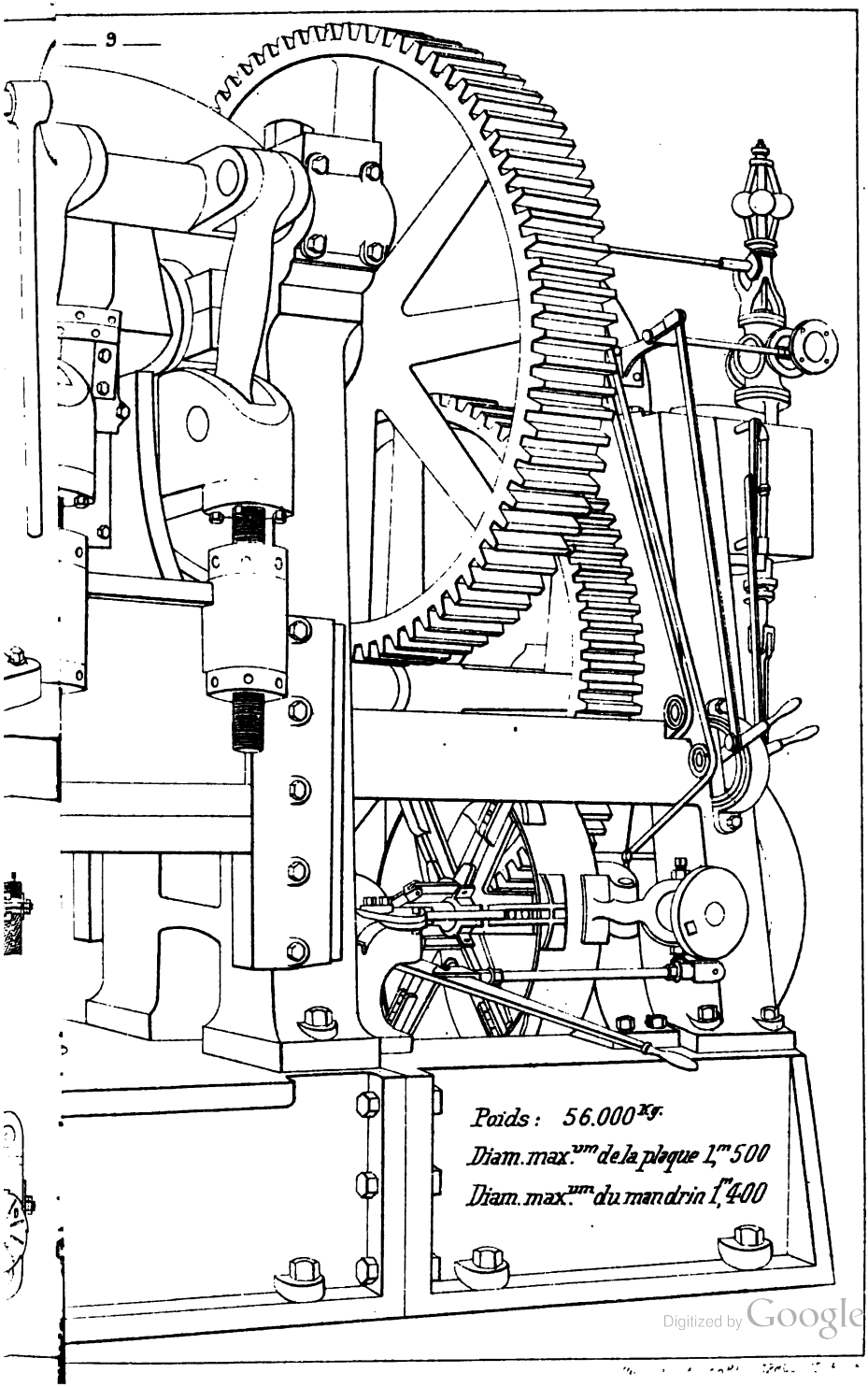




—7—



Digitized by Google



Digitized by Google

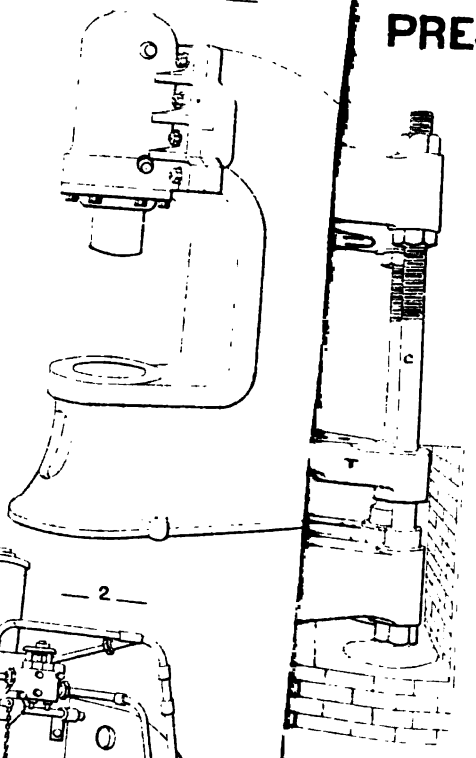
Digitized by Google

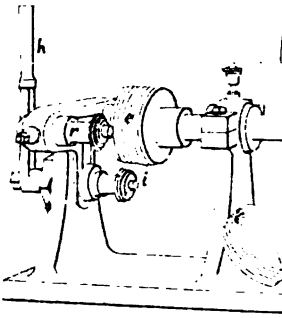
Digitized by Google

Digitized by Google

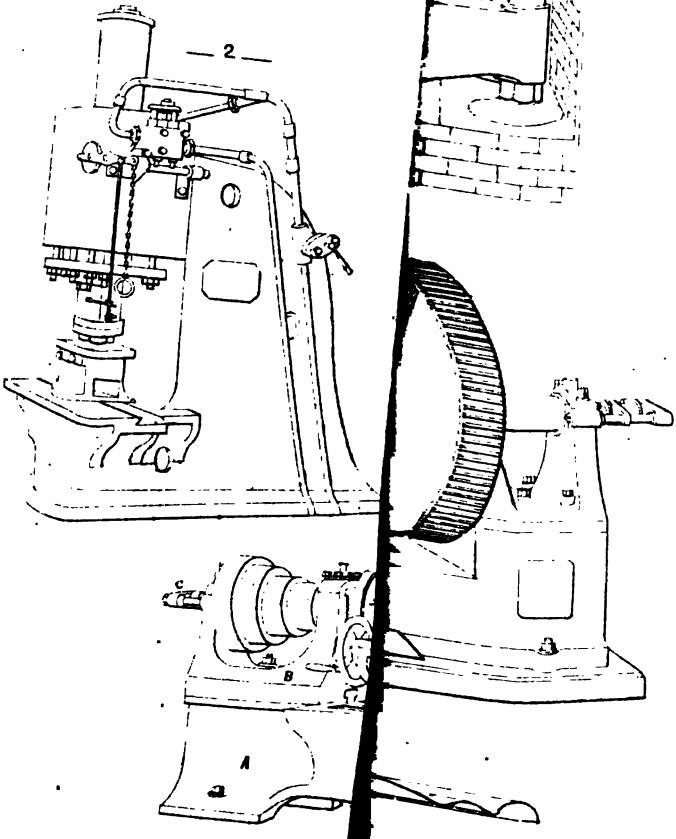
Digitized by Google

PRESSES HYDRAULI(
TOURS

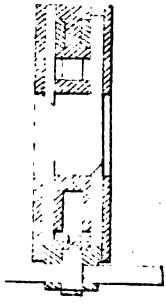


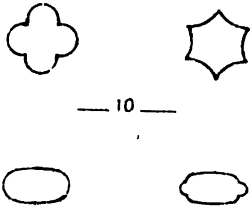


— 2 —



— 8 —

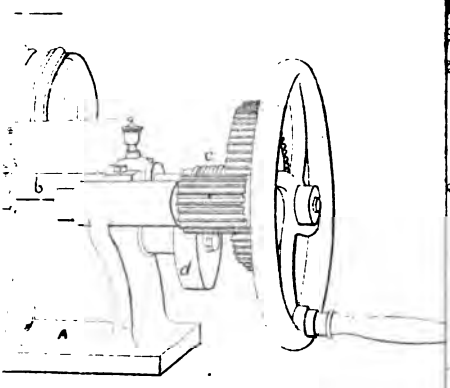


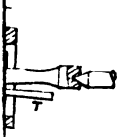


— 10 —

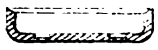
Digitized by Google

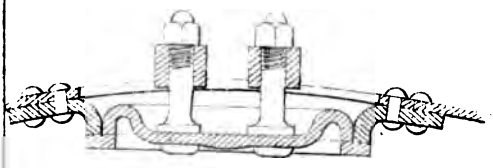
ULIQUES ET A VAPEU
RS. A ESTAMPER



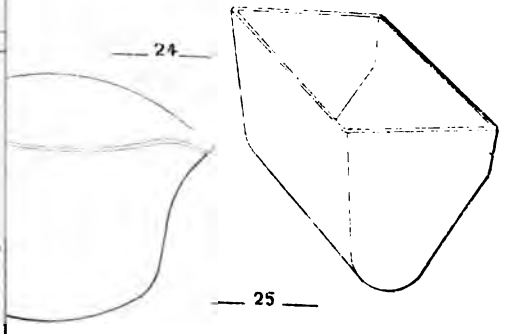


— 23 —

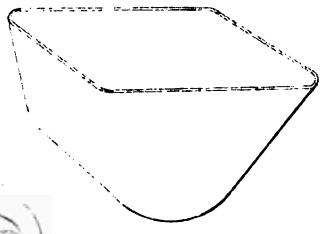


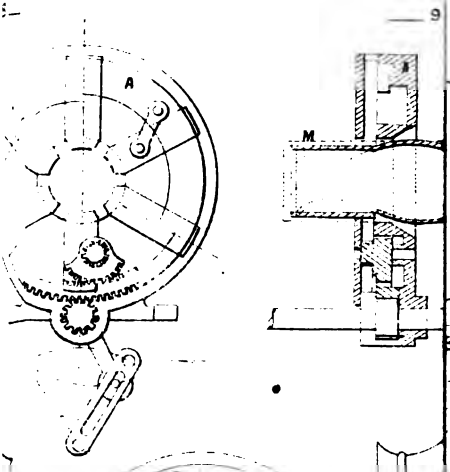


— 24 —



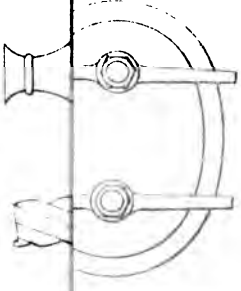
— 25 —





— 9 —

— 27 —



— 28 —

Digitized by Google

Digitized by Google